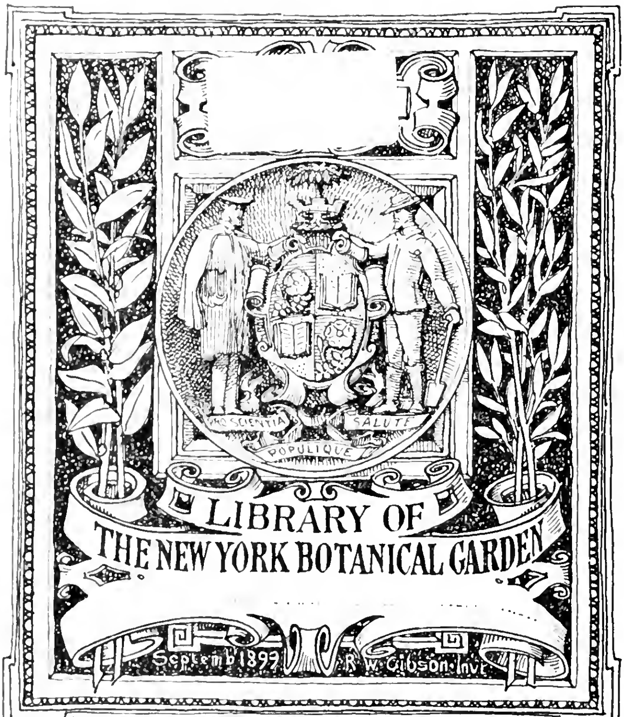
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TWENTY-FIFTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Massachusetts Board of Agriculture:

WITH AN APPENDIX

CONTAINING

REPORTS OF DELEGATES APPOINTED TO VISIT THE COUNTY EXHIBITIONS,

WITH

RETURNS OF THE FINANCES OF THE AGRICULTURAL SOCIETIES,

FOR

1877.

BOSTON:
Rand, Avery, & Co., Printers to the Commonwealth,
117 Franklin Street.
1878.

STATE BOARD OF AGRICULTURE, 1878.

Members Ex-Officiis.

His Excellency ALEXANDER H. RICE.
His Honor HORATIO G. KNIGHT.
Hon. HENRY B. PEIRCE, *Secretary of the Commonwealth.*
WILLIAM S. CLARK, *President Mass. Agricultural College.*
CHARLES A. GOESSMANN, *State Agricultural Chemist.*

Appointed by the Governor and Council.

	Term Expires.
PAUL A. CHADBOURNE of Williamstown	1879
MARSHALL P. WILDER of Boston	1880
JAMES S. GRINNELL of Greenfield	1881

Chosen by the County Societies.

Massachusetts	CHARLES S. SARGENT of Brookline	1880
Essex	BENJAMIN P. WARE of Marblehead	1881
Middlesex	JOHN B. MOORE of Concord	1879
Middlesex North	JOHN A. GOODWIN of Lowell	1880
Middlesex South	THOMAS J. DAMON of Wayland	1881
Worcester	O. B. HADWEN of Worcester	1881
Worcester West	WILLIAM A. WARNER of Hardwick	1881
Worcester North	JOHN F. BROWN of Lunenburg	1881
Worcester North-West	ENOCH T. LEWIS of Athol	1880
Worcester South	NATHANIEL UPHAM of Sturbridge	1880
Worcester South-East	WILLIAM KNOWLTON of Upton	1879
Hampshire, Franklin, & Hampden,	MILO J. SMITH of Smith's Ferry	1879
Hampshire	HENRY C. COMINS of North Hadley	1880
Highland	ABIEL K. ABBOTT of Chester	1881
Hampden	J. N. BAGG of West Springfield	1879
Hampden East	HORACE P. WAKEFIELD of Palmer	1879
Union	FRANKLIN C. KNOX of Blandford	1880
Franklin	ARTHUR A. SMITH of Colrain	1880
Deerfield Valley	OTIS J. DAVENPORT of Colrain	1881
Berkshire	JOHN E. MERRILL of Pittsfield	1879
Hoosac Valley	WILLIAM E. JOHNSON of Williamstown	1879
Housatonic	DANIEL B. FENN of Stockbridge	1879
Norfolk	HENRY S. RUSSELL of Milton	1880
Hingham	EDMUND HERSEY of Hingham	1879
Bristol	AVERY P. SLADE of Somerset	1881
Bristol Central	JOHN A. HAWES of Fairhaven	1879
Plymouth	JOHN LANE of East Bridgewater	1881
Marshfield	GEORGE M. BAKER of Marshfield	1879
Barnstable	S. B. PHINNEY of Barnstable	1880
Nantucket	ALEXANDER MACY, Jun., of Nantucket	1879
Martha's Vineyard	HEBRON VINCENT of Edgartown	1880

Charles L. Flint, *Secretary.*

THE

QUARTER CENTENNIAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE.

To the Senate and House of Representatives of the Commonwealth of Massachusetts:—

THE State Board of Agriculture was organized twenty-five years ago. It was designed to systematize and to supervise the distribution of the bounties offered by the Commonwealth through the county agricultural societies, — a method of encouragement originated as early as 1818, in furtherance of a clause of the Constitution, or organic law of the State, chap. v. sect. 2, which makes it "the duty of legislatures and magistrates to encourage private societies and public institutions by rewards and immunities, for the promotion of agriculture, arts, sciences, commerce, trades, and manufactures, and a natural history of the country."

The bounties, at first very limited in amount, on account of the small number of societies then in existence, had gradually increased by the multiplication of such societies, till they amounted, in 1852, to more than nine thousand dollars a year. Certain returns were required to be made as a condition of receiving the bounty; but they were not published or made known to the public till the year 1845, when a small pamphlet was issued, under the direction of the Secretary of the Commonwealth, containing the more important portion of the transactions of the societies, little condensed and in a

form possessing few attractions for those whom they were intended to benefit. These volumes were, therefore, little read. They were not sought after to any extent by the people; and the editions were left on hand in great numbers, stored in the spacious lofts of the State House. But the publication was continued annually, notwithstanding the limited call for them; and constant additions were made to the large accumulation of back numbers.

This indifference arose in part from the fact that the habit of reading was far less common among the farming community of that day than it is at present. There was little spirit of inquiry, little taste for investigation, little interest in farm improvements, compared with what we see at the present day. But it was due in part, no doubt, to the fact that there was no uniformity in the returns of the various societies, and they could not be arranged so as to offer the means of ready comparison. The volumes were not indexed; and it was extremely difficult, without wading through a vast mass of material, to find any thing that might be wanted. The returns, generally very poor and meagre at the best, were not thrown into an attractive form; and they consequently fell dead, so far as any influence in awakening an interest in agriculture was concerned.

In order to do something to arouse the farming community from the general apathy that seemed to prevail, the trustees of the Norfolk Agricultural Society, at their meeting on the 28th of January, 1851, *Voted*, "That the president and secretaries be a committee to mature and adopt a plan for a convention of delegates from the various agricultural societies of the Commonwealth, to be holden at some convenient time and place, the object of which shall be to concert measures for their mutual advantage, and for the promotion of the cause of agricultural education." In accordance with this vote, arrangements were made to hold a convention of delegates at the State House on the 20th of March, 1851, when the Hon. Marshall P. Wilder was chosen president; the vice-presidents consisting of the presidents of the various societies represented on the occasion, the venerable ex-Gov. Lincoln of Worcester at the head of the list.

The deliberations of this convention resulted in a central Board of Agriculture, from which grew the present depart-

ment of the State government, whose organization was effected the following year by an Act, approved by the Governor April 21, 1852. The first important duty was to arrange some uniform system of returns, in order that the manner in which the bounties were distributed through the societies might readily be seen and compared. To accomplish this object it was necessary to prepare suitable blanks, the details of which were to be perfected by the experience of subsequent years.

Measures were thus taken to secure a greater degree of system and uniformity; and, as a result, the Reports of the Board soon became more attractive and widely sought for, and the number printed was increased from three thousand to five thousand, then to eight, ten, and afterwards to twelve thousand copies; and this number fell far short of supplying the demand in the State, to say nothing of the eagerness with which they were sought after in other States with which the Board instituted an exchange, as well as with many foreign countries, in Europe, the Sandwich Islands, Australia, &c. Meantime, the popular taste for reading and for scientific investigations in the domain of agriculture gradually increased, and the spirit of inquiry became more general.

It would be easy to show the operations of the Board in detail, and its influence upon the agriculture of the Commonwealth. It took measures, quite early in its history, to secure a greater protection for the interest of sheep husbandry; and though the laws enacted for the purpose of encouraging that industry have not had the effect to multiply sheep, and to cover our hills with the tracks of the "golden hoof," the law, strenuously opposed at first, has remained on the statute book, and is generally regarded as just and useful, and is as rigidly enforced, because sustained by public sentiment, as any law which bears directly upon the pockets of the people. The law and its amendments, all of which originated in the Board, after affording an adequate protection to the owners of sheep that may have been destroyed by dogs, has had the effect to restore to the towns a surplus fund of nearly a hundred thousand dollars a year for the support of town libraries, public schools, and the advancement of learning.

Early in its history, also, it instituted an elaborate and accurate series of experiments designed to throw light upon

a multitude of questions relating to the details of feeding stock, the drainage of lands, the effect of special fertilizers upon the growth of crops, and many other points. These experiments, very numerous, and attended with great labor and expense, though not to be compared for value, perhaps, with more recent investigations carried on with the advantage of modern and more accurate scientific methods and appliances, were among the best and most valuable of that day, and did much to lead to a greater spirit of investigation, and to lay the foundation of the more recent steps of progress.

The law for the encouragement of town societies, or farmers' clubs, originated in the Board, and many of the numerous active town organizations resulted from it. Appropriations were for a time made by the Legislature to enable the Board to sustain agents and lecturers, to visit towns where such organizations existed; but owing partly to the want of suitable men, and partly to the little interest at that time in the discussion of scientific questions relating to agriculture, the results were not commensurate with the expense involved, and the plan was abandoned, after the experiment had been fully tried, for the more effective and popular system of public lectures and discussions, which have been found to impress larger masses of men, and to have a far greater influence upon the agriculture of the Commonwealth.

When the pleuro-pneumonia was first imported into this State, in 1859, it was not recognized by the veterinary surgeon called in to treat the disease, and its existence and the danger to be apprehended from it were little noticed. As soon as the attention of the Board was called to it, active measures were taken to interest the Legislature so far as to secure an appropriation adequate to its extirpation. A small appropriation was asked for, which, if it had been promptly granted, would have accomplished the object, and thus have saved many thousands of dollars to the State treasury, and great loss and suffering to numerous individual owners of stock.

Strange to say, owing to the ignorance that prevailed at that time in regard to the nature and the terrible danger of the disease, the application met with determined and persistent opposition; so that, when the appropriation was finally made, it proved to be wholly inadequate to meet the case.

During the delay and the hesitation incident to protracted hearings, the insidious disease was rapidly spreading from herd to herd; and every day, every hour, increased the difficulty and the expense of checking it. It was through the efforts of the Board that a cattle commission was created, and clothed with power to control contagious diseases among stock.

No intelligent or fair-minded man will deny, that, if it had not been for the persistent and determined efforts of the State Board, we should have had the most dangerous and the most terrible of all the contagious diseases among stock permanently fixed upon our herds. The cost to the State treasury of all the efforts for its extirpation, extending over several years, was about seventy thousand dollars; and it was by far the best investment the State ever made, since it saved the loss of millions of dollars to the State and the country. No man of ordinary intelligence now doubts the contagious character of the disease. It must be regarded as more dangerous and more to be dreaded than the rinderpest, or cattle-plague of Europe, on account of its long period of incubation, during which it is utterly impossible to detect its presence, thus giving the owner of cattle that have been in contact with it an opportunity to spread it far and near, with little risk of exposure, in his anxiety to save himself from certain loss. The value of the service which the Board thus rendered to the State far surpassed all the cost incident to its organization, from the date of its existence to the present time.

The Act of the Legislature commonly known as the "Fertilizer Law," designed to regulate the manufacture and sale of commercial fertilizers, originated in the Board: and, though it met with determined opposition from the first, it has come to be regarded as one of the most useful laws ever passed; and has commended itself not only to farmers, for whose protection it was originally designed, but to the manufacturers themselves, from the fact that the public confidence in the general honesty of the manufacture of such articles has increased their use by farmers to an amazing extent. The regulation of this trade has indeed worked an entire revolution in the whole business of commercial fertilizers, and placed it upon a far higher standard than it ever

had before, while the scientific investigations and reports of the State Inspector of Fertilizers, appointed by the Board, have been among the most valuable contributions to scientific agriculture and to agricultural literature ever published in this country.

The importance of this change will be more and more appreciated when it is considered that the judicious use of artificial fertilizers increases the possibilities of production many fold. The amount of plant-food to be accumulated upon the farm, under the old system of farming, had its limits. It could be increased to a certain extent by extraordinary care and labor; but there was always a point beyond which it was not economical to go. When that point was reached, it became very desirable to seek foreign aids. They were offered in the form of guano, and more recently in superphosphates and in a great variety of other forms; but so great and so general had been the disappointment in their use, owing to the fraud and imposition in the manufacture, that farmers had come to entertain a universal distrust of them. That some action was absolutely needed is sufficiently clear also, from the fact that several of the States have enacted laws modelled after our own.

In 1864 the Board instituted a series of public meetings for lectures and discussions, to be held in various parts of the Commonwealth, to which the whole community were invited, and in which all could take part. These meetings, begun at Springfield, have been held in all sections of the State, and, though not very largely attended at first, have become very popular, attracting large audiences, and creating great and well sustained enthusiasm. The last of these meetings was held in the town of Waltham by the special invitation of the thriving Farmers' Club of that town.

PUBLIC MEETING OF THE BOARD

AT WALTHAM.

The country meeting of the Board was held at Waltham on the fourth, fifth, and sixth of December.

The sessions began on Tuesday, Dec. 4, at noon, in Rumford Hall. The hall was very handsomely decorated with flowers and potted plants, conspicuous among which was an orange tree, with an abundance of the golden fruit upon it. The attendance was unusually large, and embraced members of the Board and prominent agriculturists from all parts of the State.

The meeting was called to order by Capt. JOHN B. MOORE of Concord, Chairman of the Committee on Meetings, who spoke as follows:—

Gentlemen of the State Board of Agriculture,—It becomes my duty, as chairman of the Committee of Arrangements, and as the delegate to the State Board of Agriculture from the Middlesex Agricultural Society, within whose limits we are now assembled, to call this, the fourteenth annual public meeting of the Board, to order.

It has been the custom, and a very proper one, for the person calling these meetings to order, to give a short account of the farming of the vicinity or county. This I do more readily, as I am willing to confess that I have a strong state, county, and town pride.

It is laudable to be proud of a State like Massachusetts, which, though small comparatively in territory, still maintains by its perseverance and intelligence a leading position in these United States.

Middlesex is the most populous county in the State except Suffolk; although it has suffered a loss in its population, of fifty thousand, by annexation of a portion of its territory to the city of Boston. It extends in a north-westerly direction from tide-water on the Charles and Mystic Rivers to New Hampshire. Within its limits there are fifty-four cities and towns.

It has quite a variety of soils, such as sandy loam, gravelly

loam, loam, clay loam, clay, peat, and considerable tracts of a very light sandy soil hardly fit for cultivation. The first two largely predominate; the first three are well adapted to market gardening. Through it flow the Merrimack, Nashua, Concord, Charles, Mystic, Shawshene, and other rivers. In the valleys of these rivers, there are a great many acres of interval lands, some of which are quite productive, although by no means equal in that respect to such lands on the Connecticut River.

As you leave the valleys of the Nashua and Merrimack, the country becomes hilly and broken, and not so readily cultivated, much of it being interspersed with ledges and bowlders; some of this land, more particularly the hillsides, being well adapted to the growth of the apple.

The sandy loams, gravelly loams, and loams, are well adapted to growing all cultivated crops and for market gardening, and the clay loams are very productive when well drained.

The farming of the northern part of the county is principally dairy farming: a small portion of the milk is used for butter-making, but the larger part of it is sent to market by milkmen. This, with fruits, grains, beef, pork, and vegetables, in a smaller way, make the principal products of the farms.

The central part produces milk for the market very largely, but does not use much for butter. The milk from this section finds a market principally at Boston. There are also grown fruits and vegetables to considerable extent, and what are termed the small fruits quite largely: these also find a market at Boston. The southern part of the county also produces large quantities of milk, which is used almost entirely for the market; but here the vegetables and fruits, both large and small, are the leading crops. Stock-raising in Middlesex, so far as relates to neat-cattle, except the raising of heifers to replenish the stock of cows on the dairy-farms, is nearly abandoned, for the reason that it can be done more economically where land, hay, and pasturage are cheaper. In the breeding of these heifers, there has been a large admixture of the Ayrshire, Jersey, and more recently of the Dutch or Holstein blood, by crossing with the best cows on the farms, and with marked benefit in the increased production of milk. Within the county there is quite a number of herds of Ayrshires, Jerseys, and Dutch cattle.

According to the recent census, Middlesex County produces 7,755,151 gallons of milk, being more than one-fifth of the entire product of the State; and the adjoining town of Lexington, 510,551 gallons of milk, worth $99,907, being more than any city or town in the State, except the city of Worcester. Of the 3,252,957 bushels of apples, Middlesex County produces about one-fourth part. As I have said before, the southern and central parts of this county are very largely engaged in the production of all kinds of vegetables for market; and, as an illustration, we find by the census report that the neighboring town of Arlington is credited with 40,457 bushels of tomatoes, being about one-fifth of the product of the State. Also the same town returns 12,683 bushels of table beets, and 5,184 bushels of table parsnips, in both instances being a greater product than any other town in Massachusetts. We also find Concord credited with 73,877 bunches of asparagus, being one-fifth of the product of the State, and more than any other town. The same town also returns 79,890 quarts of strawberries, being more than any other town in the State, except the town of Dighton. These are only a few examples. Many of the towns in the southern and eastern parts of the county would show substantially the same results. And the fact that within this county there are very extensive manufacturing establishments of cotton, woollen, leather, iron, wood, and other articles, which have created cities and towns, would account for this interest in this branch of farming.

And here, in this town of Waltham, there is not only the first cotton-mill established in the State, but what is claimed to be the largest and most perfect watch-factory in the world, a village in itself.

All these various industries create a market near to the farms, for the products of the garden, orchard, and field. This county has three agricultural societies. The Middlesex has held its eighty-fourth exhibition, and is the oldest county society in Massachusetts, and holds its exhibitions at Concord; the Middlesex North, at Lowell; and the Middlesex South, at Framingham. Both of them have been formed from portions of the old society.

And in addition to these there are a number of town societies and farmers' clubs. These societies hold annual exhibi-

tions of stock and products of the soil, where the farmers and others interested can attend, and examine the different breeds of cattle and other animals, the different varieties of grain, fruits, and vegetables, and can determine for themselves which are the best and most desirable to have; and at no other place can there be found the same convenience for comparison as at a good agricultural show. These societies were formed and encouraged by the prominent farmers of the county.

In the development of a better system of agriculture, in the latter part of the last and the first part of the present century, the leading agriculturists of the time felt that there was a necessity for radical changes and improvements in the management of the farm. Under the old methods, the land was fast becoming poorer; crops were grown at the expense of the soil, almost, I might say, without any compensating return to the land, which was by this treatment being exhausted, and, in fact, much of it had become worthless for cropping; meadows were left undrained; upland was allowed to run to weeds, the crop not being worth harvesting. Cattle were bred without any attempt, perhaps I should say without any intelligent attempt, to improve them, either in size or in milking qualities for the dairy; and I fear that that is continued to-day to some extent. And then, as a general rule, they were but poorly fed and sheltered in the winter, and, when leaving the barns in the spring for the pastures, were but sorry specimens of what they should have been, either for beef or the dairy.

Now, I well remember that when I began farming on my own account, in the year 1840, I carried to Boston potatoes in a one-horse market-wagon, and sold them for seventy-five cents a barrel, that I sold butter for twelve or thirteen cents a pound, eggs for eight cents a dozen. At that time the farmers sold their produce mostly at the country stores, or, I should say, exchanged it, taking their pay mostly in store-goods. Now the farmer's produce sells for cash, except milk, on which there is a short time allowed; and this is a decided improvement over the old method of sale. It is true that the farmers of eighty years ago did not have the fine light tools of the present day to work with, and therefore could not accomplish as much good work as at the present

time. Neither should we now have had them if it had not been for this spirit of inquiry which actuated these men's minds, this brain-work which showed the great necessity for better tools and implements of husbandry as well as methods. And then, as soon as this want became known, it was urged upon the inventors and mechanics, who have gradually made these great improvements in tools and all other implements used by the farmers. This Board itself is but an outgrowth of these and the other agricultural societies, made up as it is by one delegate from each society, and three appointed at large by the governor, and a few others *ex officio*. The necessity of fostering this great interest, upon which the success of all manufactures and commerce depends, and which lies at the foundation of this and all other nations' prosperity, became so apparent to a few gentlemen, at the head of whom was Hon. Marshall P. Wilder, the senior member of this Board, that they applied to the Legislature, which passed an Act establishing the State Board of Agriculture, and giving it the general control of all agricultural matters within the State. These meetings are one of the methods adopted by the Board for aiding the farmers and others interested in finding better, more economical and successful methods of farm husbandry, and have become, under this management, a part of the system of State agricultural education.

The Committee of Arrangements have procured lecturers to open the subjects before this meeting; but we depend upon all in attendance to discuss them in a spirit of fairness and intelligence, and to give the results of their practical experience, and to throw such light as they are able upon the matters before the meeting.

In the selection of subjects for the lectures and discussions, we have followed the usual custom, and have selected such as were somewhat adapted to the locality where the meetings are held, as by so doing we should create a greater interest in the immediate vicinity of the meeting.

And now allow me to say a few words about the town of Waltham, which, as many of you know, is located in the immediate vicinity of the great market-garden interest of the State. A ride of ten miles in almost any direction from where we now are would take you through a section of

country in which you would find farms, market-gardens with the usual appliances of hot-beds and forcing-houses, florists with their greenhouses, suburban residences, many of them with beautiful and extensive pleasure-grounds, adding not only beauty and variety to the landscape, but an actual cash value to the farms and gardens in their immediate vicinity; for it is well understood, that, the better the surroundings, the more valuable becomes the neighboring property. Now gentlemen, we meet here to-day, in this good old town of Waltham, and by a special invitation of the Waltham Farmers' Club, — an organization entitled to its well-earned reputation of being one of the most active, efficient, and progressive clubs in the State. I hardly need to add that you have fallen among friends of large hearts and unbounded hospitality.

And now allow me to assure you, visitors as well as members of the Board, that it gives me great pleasure to meet you here in Middlesex County; and I trust, that, with your aid, we shall make this not only an instructive and profitable meeting, but one to be remembered with pleasure hereafter.

Now, gentlemen, I have the honor of introducing to you the Rev. BENTON SMITH, President of the Farmers' Club of Waltham.

ADDRESS OF WELCOME.

BY REV. BENTON SMITH.

Gentlemen of the State Board of Agriculture, — The Farmers' Club of this town, and the selectmen in behalf of the citizens generally, have charged me with the very pleasant duty of extending to you a welcome to Waltham and its hospitalities. By those who are unacquainted with it, Waltham is supposed to be almost exclusively a manufacturing town; but it is largely agricultural. Therefore the people appreciate the action by which you decided to hold this meeting with them, sure that you will enlighten and quicken them in regard to one of their great interests.

It has been a quiet town, in which its inhabitants have pursued their various kinds of business with intelligence and industry, without being aware of how directly and powerfully

they were influencing the business of the world at large; and even its own people have been surprised to learn that the eyes of all nations are turned towards it, and that its name is fast becoming a familiar one upon the lips of all people, because of its peculiar manufactures, which are of importance not only to its own people, and to our state and country, but to the world.

Within view from the hall in which we are assembled, stands the first cotton-mill of the world, where, beneath a single roof, cotton was taken in a raw state, and manufactured into cloth by power. The system of performing different parts of cloth-making in separate and sometimes distant buildings is still adhered to in the Old World. In Manchester there may be seen to-day great loads of yarn that was spun in one building, in transit to another and distant one, to be woven into cloth, at great loss of time and expense in the transportation. Since the erection of this mill, all the large manufactories of our country have been built upon the plan adopted by the Boston Manufacturing Company; and the economy and comfort of the system have no doubt given our manufacturers one advantage over those of Europe.

Very soon after this mill was put in operation, wise business considerations induced the company to erect a bleachery, — the second large one in the country, — which now prepares for sale not less than fifteen tons of cloth daily. So we can almost say that this is the first place in which raw cotton was made into cloth, bleached, finished, and packed in boxes ready for shipment, beneath one roof.

The establishment of the bleachery created a demand for sulphuric acid and bleaching salts. Up to this time, these chemicals had been made in this country in small quantities and by individual manufacturers. The Boston Manufacturing Company encouraged the formation of a company that should make the chemicals in large quantities. And one was formed whose works soon covered many acres.

But while the men who accomplished all this looked for a just return for the risk they assumed, and the capital and wisdom and genius they invested, and were fully entitled to it, they did not consider their pecuniary interests alone. They were men of large hearts and large souls, as well as men of large means and brain; and they provided generously

for all the higher needs of those who might be in their employ. When they purchased their first bales of cotton, they purchased also a large library of choice books, and placed them in their counting-room for the free use of those who should do the labor of turning that cotton into cloth. They encouraged the formation of a literary society, and one was formed that took the name of Rumford Institute. The company then erected the hall in which we are gathered, for the use of the institute, made over to it their library, and granted it the use of the hall upon condition that it would expend a certain sum of money annually to enlarge the library. And here the members met to engage in discussions and to conduct other literary exercises; and here, under their auspices, courses of public lectures were given, season after season, by the ablest men of the time. This institute, if not the first, was nearly the first, in this country that maintained a library, conducted literary exercises, and supported a course of lectures yearly. And now, after more than fifty years since its formation, it still exists, and maintains its annual course of public lectures and entertainments.

They also provided amply for the education of the children of those whom they might employ; for they built the first schoolhouse erected in this part of the town, placed the name of the teacher upon the pay-roll of the corporation, and made the school free to all. And even after the town took charge of the schools located here, they provided a schoolhouse, free of expense to the public, for many years.

They also built the first church erected in this section of Waltham, to meet the spiritual needs of their operatives. The company let the pews and collected the rents, and placed the minister's name upon its pay-roll; and his salary was regularly paid by its treasurer.

In addition to these great public benefits, the company reserved from sale this tract of land which is now our public common, and of which our citizens are justly proud; and by this generous forecast they provided for the pleasure, the refinement, and health of the community.

Waltham, therefore, owes very much of its growth, its intelligence, its industry, its public spirit, and its character for quiet self-reliance, to the Boston Manufacturing Company. And we can but pray that the spirit which animated the men

who composed it may fill and animate all the men who may lead in the business enterprises of the future of our country.

The manufacture of the chalk crayons that are now so universally used in our public schools, and other institutions of learning, originated in this town. Before these were manufactured, shapeless lumps of chalk were the only article used in the schoolroom in work upon the blackboards. Now these carefully prepared and nicely shaped crayons have banished the crude chalk from the schoolrooms, not only in our own country, but also in most distant ones; for they are sent to England, France, Germany, Russia, and even to Japan. So Waltham can be said to make its mark all over the world.

The first attempt to manufacture watches entirely by machinery, and upon the system of making all the corresponding parts of the watches perfectly interchangeable, is due to American genius and skill. The establishment in which the effort was first made was located in Roxbury; but, after a brief existence there, it was removed to Waltham and permanently located here. The watches are made entirely by machinery, that works so accurately and regularly, that, should any part be broken or otherwise rendered useless, a corresponding part can be supplied by the manufactory, which will just fill the place at once, and perfectly perform the work of the injured part.

After long and severe struggle against very many obstacles, the American Watch Company has gained a world-wide reputation for the superiority of its watches. Europe, especially Switzerland, believed itself possessed of a monopoly of the watch-making of the world; and it was quietly enjoying the belief that this monopoly could never be disturbed, until M. Edouard Favre-Perret, one of the Swiss commissioners to the Centennial Exhibition, and a member of the International Jury on Watches, saw and examined the watches of the American Watch Company at Philadelphia, and visited the works here, and returned home to startle his countrymen and all Europe from their sleep in regard to this manufacture. Upon his return, at a meeting held to hear his report, he assured his fellow-craftsmen, that they had been living over a "volcano;" for the American Watch Company had been making a much cheaper and better watch by machinery

than they had made or could make by hand; that, indeed, the American watches had justly gained such a reputation for excellence, that they must arouse themselves at once, and exercise all their skill and ingenuity to the utmost, or America would supply Europe with watches. He went even further than this, and told his astonished listeners, that, even if they did arouse themselves, the American market was closed to them, and that they would meet with a sharp competition from the American manufacturers upon their own soil.

To substantiate his statements, he gave his audience some facts respecting the running of an American watch of no higher quality than the medium grade, and which he took at random from a "heap," as he said, and upon which he had permitted no special work to be done, that he might observe the running of the average watch. Upon arriving home, he handed the watch to an adjuster, who, upon returning it, said, "I am completely overwhelmed; the result is incredible; one would not find one such watch among fifty thousand of our manufacture." This is the testimony of honorable men holding the highest position in the business of watch-making, who saw that a great manufacturing interest of their nation was in imminent peril.

From twenty to thirty thousand of these watches are sold annually in England. The agency for them in London is located in a building called the "Waltham Building." There are agencies in Moscow and St. Petersburg. And they have long been sold in the East Indies and Australia.

The system of watchmaking adopted by the American Watch Company is completely revolutionizing the watch-making of the world. It has already given rise to an establishment in our midst, the first of its kind, in which are made every kind of watch, clock, and case manufacturer's tools. And it is now making these tools for foreign as well as home manufacturers.

And we are not sure but an enterprise just started here will displace the old style of clocks; for a company has just been formed for the manufacture of clocks, in which electricity is substituted for the old weights and springs; and that mysterious fluid, that seemed utterly regardless of time, is made to stop, and patiently and accurately mark the passing moments and hours.

We have other and more usual manufacturing interests of which I might speak. We have a large hosiery-mill and dye-works. We have iron-founders whose enterprise and ability enable them to secure large contracts for work outside the country. We have machinists whose productions have a high reputation.

But, gentlemen, do not think, because I have occupied so much time in speaking of the manufactures of Waltham, that I have forgotten the object of this meeting; forgotten the great interests of which you stand officially at the head in the State, and forgotten the character of the club, and the business of a large portion of the citizens whom it is my privilege to represent. The tiller of the soil came here before the manufacturer. The manufacturer could not have come unless the farmer had come before him. This is the order in which all lands have been settled, and it will continue to be the order of their settlement in all time to come. In the condensed and brief history of the first steps in civilization contained in that old book that we hold sacred, we are told that after the moral sense of our first parents was awakened, they clothed themselves with leaves. They next made coats of skins, showing that they had mastered the wild beasts. Then Abel became a herdsman, showing that the wild beasts had been tamed. Then we are told that Cain was a tiller of the earth, and was the first that "builded a city." The agriculturist built the first house erected in our world. That he should do so, was the natural consequence of his business. However rude, whether made of branches of trees or rough stones, the tiller of the soil built the first house and established the first home. The tiller of the soil built the first house in Waltham. And the towns throughout our country were first settled by men and women who struck into the wilderness, made a clearing, built a house, and put seed into the soil. To-day it is the farmer that pushes westward upon the prairies, makes a settlement, establishes a home, and so extends the area of civilization. The mechanic and manufacturer follow after. This is the original order. For, turning to that brief history of the first steps of our race in civilization again, we find that the mechanic and the manufacturer did not appear until the sixth generation after the farmer had built the "city," in Tubal-Cain, the worker in metals.

And when the manufacturer comes to meet demands that the agriculturist creates, and puts new and desirable life into the town, we must not forget, in the rapid growth and thrift and quickened life he produces, that the agriculturist first planted the settlement.

Fortunately for Waltham, all classes of its citizens are interested in agriculture. There have been no walls of separation between its farmers and its mechanics, manufacturers, and merchants. Some of the men who were leaders in establishing manufacturing here owned large farms, and were practical agriculturists, and were influential in securing the formation of the Farmers' Club. Many of our citizens whose business calls them to Boston daily seek pleasure and relaxation from business upon their farms and among their stock. Our Club gives evidence of the appreciation of our citizens of all callings, of the farmer's business; for it is composed of mechanics, manufacturers, tradesmen, and members of the different professions, as well as farmers. It has been in existence more than twenty years, and in a quiet way has accomplished an amount of good that can hardly be estimated. Besides giving to each member the results of the observation, the experience, and the experiments of all the other members, it has created and kept alive a true spirit in the community, and contributed to a fine social life.

Our manufacturing establishments are all situated near the southern boundary of the town, upon the poorer portion of the land; while the rich soils of the eastern, northern, central, and western portions of the town, are used for agriculture. The needs of a large city like Boston, and of an increasing population nearer home, determined the kind of farming to be followed. The production and marketing of milk have long been a prominent business of our farmers. Therefore grass and milk are their principal productions. Large quantities of fruit have been raised. And now garden-farming has become a prominent business.

Nature was lavish in giving charms to Waltham, for we have mountain and plain and hill and river combined in one beautiful landscape. Its natural beauty has long made Waltham an attractive place of residence to men of fortune. They purchased large tracts of land, brought it into a high state of cultivation, procured the best stock, improved the

roads and planted shade-trees beside them, and utilized the brooks to adorn their estates, without changing the agricultural character or appearance of the town, and added new beauty to the natural attractions of the place.

Good roads are necessary to the prosperity of any place. And the excellence of our roads, and the mode of caring for them, have been commended in town, state, and national reports.

We welcome you to this town, for we know your presence will be profitable to us. And we will endeavor to make your visit pleasant to you. If you can find time from the duties of the meetings to visit some of our farms and manufactories, we shall esteem it a pleasure to afford you every facility for gratifying the wish.

Afternoon Session.

The meeting was called to order at two o'clock, by Capt. Moore, who stated that the subject for consideration was Market-Gardening and Vegetable Culture, and introduced, as the essayist of the afternoon, William D. Philbrick, Esq., of Newton Centre, who read the following paper: —

MARKET-GARDENING AND VEGETABLE CULTURE.

BY WILLIAM D. PHILBRICK.

The essential things for a good market-garden are nearness to a good market, a good soil, and sufficient capital. A good gardener should have a natural tact for the business, which will include habits of industry and a keen, observing eye, and should have some years' experience ; for it is a trade that cannot be learned wholly from books and papers, but needs practical acquaintance with the many details of the work for success. Many of the failures in attempting this trade are due to want of capital, but perhaps more to want of the necessary experience or of natural tact.

The distance from market will control, in great measure, the nature of the crops that can be profitably grown. Within six miles of a large city, the manure-wagon and market-wagon can make two trips in a day if needful; and this nearness gives a very great advantage where a large amount of manure

must be applied to a small amount of land, and balances the greater value of land, and higher taxes and rent, or interest, which encumber the garden near town. Many of the gardens near Boston are worth over one thousand dollars per acre: it is within six miles of Boston market that we find the best vegetable gardens devoted to the culture of the bulky but valuable crops, such as lettuce, cucumbers, garden greens, early beets and cabbages, early onions, melons, celery, cauliflowers, horse-radish, winter spinach, and some others.

The amount of manure used on these gardens is from twenty to thirty cords per acre every year. It keeps a two-horse team going every day to draw the manure used on some gardens of not over twelve acres; and the produce on some of these gardens will average one thousand dollars per acre per year, for the whole garden, for a term of five years. The market-wagon upon such a garden makes daily trips to market, and at certain busy seasons three or four loads daily will be sent. When the distance from market is more than seven and less than fifteen miles, the nature of the business is changed. Land is cheaper, being worth from fifty to two hundred dollars per acre; the hauling of manure and of produce costs double or more what it does nearer market; and here it is that we find the gardeners (or farmers as they are more properly called) devote their energies with greater profit to such vegetables as require less manure, and are less bulky, such as early potatoes, pease, beans, asparagus, strawberries, and other small and large fruits, squashes, late cabbages and turnips, and other roots. On these more remote gardens, the market-wagon will make only three or four trips per week, in general, in summer, and two in winter. The value of the crops raised will, in general, range from two hundred to five hundred dollars per acre. The amount of manure required for the good management of these farms will be from six to ten cords per acre.

The nature of the soil has much to do with a good garden. The best for general purposes is a deep black loam, well drained by a subsoil of fine sand; but it is desirable to have some variety of soil, as no one soil is adapted to produce all the vegetables in perfection. A rather stiff soil suits late cabbages, celery, and cauliflowers; while early lettuce, radishes, beets, and roots in general, as well as greens and most

early crops, do best on a warm, sandy loam. If the soil is a dry, loose gravel, it is utterly unfit for any kind of gardening. Stiff clay and boggy lands, when well drained, often make excellent garden-land, especially for late crops.

The capital needed for gardening is larger than would be supposed by one unacquainted with the business. For gardens near market, five hundred dollars per acre is often profitably employed, invested in buildings, teams, tools, hot-beds, manure, &c.; and the force on such gardens is about one horse to every three acres of land, and in summer, one hand to every acre. On the more remote gardens a less capital and force are used, the capital ranging from one hundred to two hundred dollars per acre, and the force, one horse and one man for two to five acres.

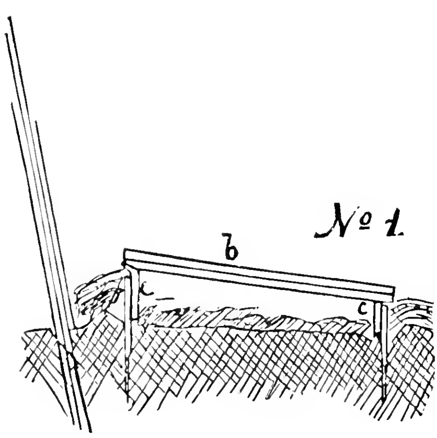
The methods used by the market-gardeners to make the most of their land are very ingenious, and deserve a more careful and extended study than can be given them in the limited time at our command to-day; but it may be useful to notice some of the plans in use, by which they force our naturally sterile soil and fickle climate to produce two, three, and even four crops in a year, from the same land, and keep our markets supplied through the arctic weather of our long winters with delicacies whose natural home is in the tropical zone.

The crops grown upon the gardens within six miles of the city are mostly spinach, kale, radishes, dandelions, beet-greens, beets, early cabbages, lettuce, onions, to be followed upon the same land by the late crops, which are melons, squashes, tomatoes, egg-plants, peppers, cauliflowers, celery, horse-radish, beets, carrots, parsnips. The only crops which occupy the land for the whole year are rhubarb and dandelions; and some gardeners grow a crop of onion sets on the same land with their dandelions. In the management of these various crops so as to meet a profitable sale, and also not to crowd and injure each other, the skill and experience of the gardener are shown. To accomplish his purposes many ingenious devices are used for forcing early crops, and for storing the late ones, so as to keep up an unfailing supply the year round. In general, only two crops are raised upon the same land in a season; but instances are not uncommon where three, and even four crops in a year are taken from one piece

of land. Thus, winter spinach, sold in March, was followed by onion sets, melons, and celery, on the same land, all full crops; again, winter spinach, sold in April, was followed by bush-beans, melons, and spinach again.

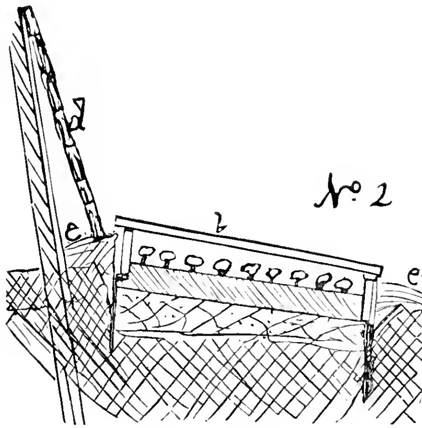
It would be idle to attempt such work as this without skilful use of glass and heavy manuring. The plants started under glass for field planting are lettuce, early cabbage, egg-plants, tomatoes, celery, melons, summer squashes; and some gardeners also start their beets and onions under glass, to be transplanted to the field; which leads us to describe the hot-bed.

The hot-bed, as used by market-gardeners, is a much more simple affair than is usually described in the books. We build a fence, facing south-east or south, using posts nine feet long, three feet in the ground, six feet above; and set them six feet apart, leaning back eighteen inches at the top, so that the mats when leaning up against them are not likely to be blown down. Planks two by twelve inches are set in the fall, before the ground freezes, so as to make a frame six feet wide, outside measure, two feet from the fence, and carefully adjusted, so that when the sashes are placed on them they will pitch five inches. The space between the planks is then covered with litter, to keep out frost, and the bed can be used at any time in the winter. When it is needed for use, the loam is thrown out, and fresh hot manure put in to the depth of six to twelve inches, according to the season of the year and the crop to be raised; the loam is then thrown back on the manure to the depth of six or eight inches, and covered with sash and mats, and after a few days the bed will generally be in order for planting.



The drawing, No. 1, represents a bed as made ready in the fall to withstand frost; *c* the planks, *b* the sash and shutters.

No. 2 represents a bed in running order in winter, with the mat *d* leaning against the fence, the planks well banked at *e* with litter.



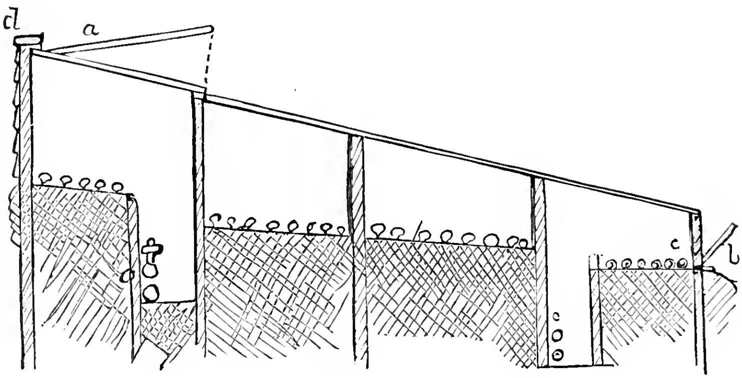
The hot-bed is invaluable for raising plants for planting out of doors: the ease with which the plants are aired and hardened off by removing the glass just before setting the young plants out of doors, makes the hot-bed far preferable to the green-house for this kind of work.

Many gardeners also raise a crop of lettuce, radishes, parsley, or carrots, in the hot-beds, before the field plants, marketing them in March, April, or May. After the field plants have been removed from the hot-beds, in April or May, and the lettuce or radishes sold, it is customary to employ the whole of the glass upon cucumbers, using a little manure to start them. It is thus that the market is supplied with cucumbers in June before the field crop comes in.

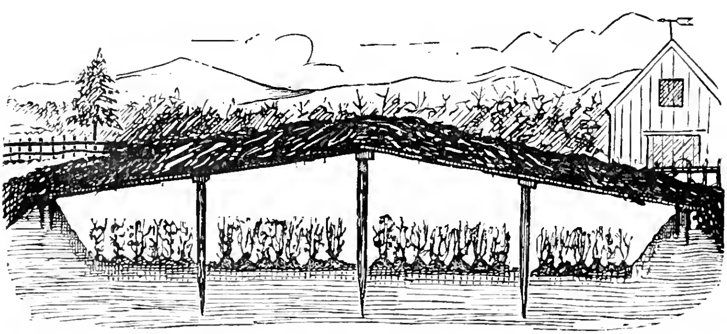
For winter work, however, in raising these crops the green-house is to be preferred; it is more manageable, and requires much less labor. The improvements in the construction of green-houses during the few last years deserve some notice.

It was formerly the custom to construct green-houses with the beds for lettuce and cucumbers raised upon benches near the glass; the benches soon rotted out, the lettuce raised on them was generally poor in quality, and gave "hot-house lettuce" a very bad name in the market. It is a much better plan to build up the beds solid from the ground, and place the heating-pipes in the alleys. The lettuce grows much more healthily thus, and the beds are more easily repaired. The drawing represents a section of a house built by the writer in 1876, two hundred feet by twenty-four feet; *a* and *b* are the ventilators, *c* the heating-pipes, *d* a plank to walk upon when clearing snow from the roof.

The management of the more remote gardens, where less labor and manure are used, differs considerably from that of the suburban garden. The early crops are here mostly pease, beans, potatoes, sweet corn; the late ones, often upon the same land, are squashes, pickling cucumbers and peppers,



tomatoes, fall cabbage, and turnips. The hot-bed is somewhat used, but less than nearer the city. The small fruits, asparagus, and dandelions, are raised in considerable quantities, and milk-raising is generally an important branch of the industry of these more remote farms. The early pease and



Section of Celery Pit.

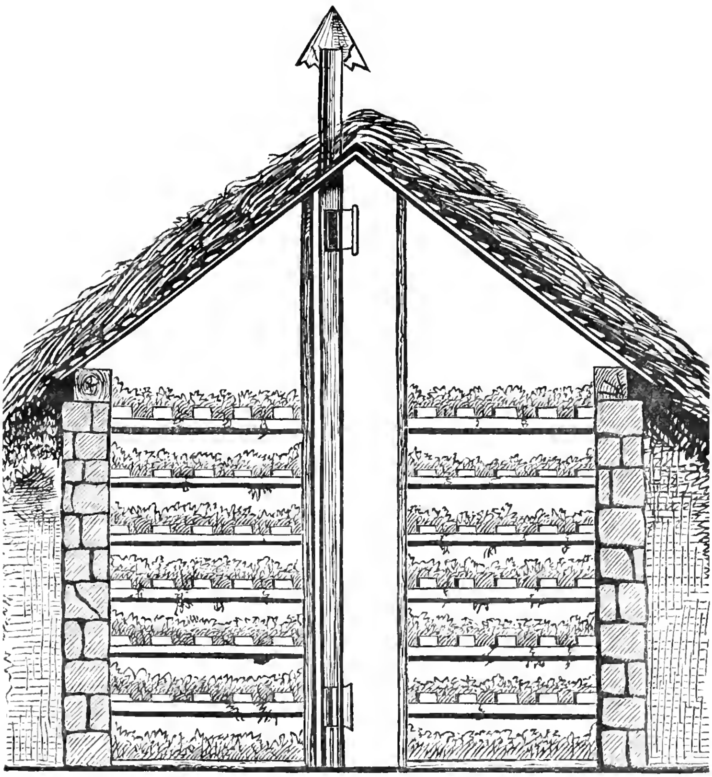
potatoes are often followed by squashes or white turnips, on the same land. Fall cabbages are also often planted after pease or early greens; and peppers are generally made to follow early lettuce.

Where early potatoes or pease are to be raised with squash-

es, every third or fourth row of the early crop is left blank for the squashes, the squash-seed planted rather late, about June 5, and the early crop cleared away before July 10, when the squashes begin to run.

There are many of the devices of double cropping in common use in the market-gardens, which might be easily and profitably imitated by the amateur in his kitchen-garden.

Among the noticeable devices of the market-gardener for



Section of Spinach House.

keeping the fall crops for winter use are the squash-house, the celery-pit, the spinach-house, the cellar.

Squashes, for keeping, need a tight house above ground, a dry air, and a temperature from 55° to 60°, which is maintained by a stove and by slight ventilation: they need picking over every ten days, to select the decayed ones.

The celery-pit needs a dry, cool air, moderate ventilation, perfect protection from frost.

The celery-pit is usually made twenty-four feet or twelve feet wide, two feet deep at the sides, covered with boards supported by posts and purlins, and the boards covered with sufficient litter to keep out frost. The celery is dug in November, and stowed away, placing a little earth over the roots, and will keep well through the winter, if well aired and cared for, airing it frequently. It needs to be kept dry, to be protected from frost, and kept as cool as may be without freezing.

The spinach house or cellar is similar in appearance to the squash-house; the shelves, however, are only fourteen inches apart: as we do not need to work between them, it is made partly under ground. As the temperature required for spinach is 30° to 35°, we need no stove, but good ventilators, and protection from frost by double walls and covering of meadow hay, &c.

The cellar for storage of roots should be well drained and frost-proof, and provided with windows or doors for free ventilation in suitable weather. Apples and onions keep well in barrels in a cool, dry cellar: the other roots do well in bins piled about four feet deep, with openings in the sides and bottom for slight circulation of air, and a light covering of hay over them to prevent them from wilting. They keep fresher if covered with sand, or earth, to prevent evaporation; but this is not generally practised. Roots intended for winter marketing are often washed in the fall, and put in barrels and headed up, and then stored in a cool cellar. They come out fresh and clean at any time in winter when thus stored. The temperature of the cellar should range from 35° to 40°. If much warmer, vegetation and decay will result. The cellar of a house is not well adapted to the purpose, being too warm, especially if provided with a furnace for heating the house, as is often the case. Moreover, the vegetable cellar in spring is inevitably encumbered more or less with decaying vegetables, which are most unwholesome in the air of the dwelling.

Where many roots are raised for feeding to stock, and where cellar-room is wanting, it will not cost very much to pit them. The pit is usually made four feet wide, by ploughing the land and shovelling out the loam at each side; the roots are piled in a ridge about three feet deep, and lightly

covered with straw or sedge, over which six inches of loam are placed, well beaten with the back of a shovel. When cold weather comes on, pile on enough litter to keep out frost; provide air-holes every rod in the length of the pit, for ventilation. Plough a deep furrow around the pit to carry off surface water.

The manure used on the market-garden is mostly horse-manure, with some night-soil and hog-manure. Land intended for early cabbages and greens is usually manured in the fall with coarse manure, ploughed under. The manure applied in spring is worked as fine as possible, so as to be available at once for plant-food. When the horse-manure is very coarse or strawy, it is used thus for hot-beds in its fresh state; but in summer it should either be thrown into a cellar to be trampled by hogs, or composted with night-soil and loam in the field. When handled in this way it does not heat excessively, and makes a manure that cannot be excelled for forcing a rapid growth of vegetables.

The tools used for market-gardening are some of them not much known elsewhere: the seed-sower most approved is the revolving brush, a modification of the Willis machine. The scuffle-hoe or shove-hoe is much used in running between the rows of greens, onions, and beets: land can be tilled with this tool almost as cheaply as by the cultivator and horse, and the rows are only fourteen inches apart where it is used.

The garden-marker is a very convenient tool for marking the places for transplanting celery, cabbages, lettuce, &c. It is a wheel about four feet in diameter, provided with handles like a wheelbarrow: the tire is provided with movable pegs; which can be adjusted at such distances asunder as are required for the various plants in question. When the land has been properly prepared, it is only necessary to trundle this tool along the row, and the pegs mark the places where plants are to be set.

The preparation of the land for garden-crops is a point that requires the application of considerable skill. The best gardeners plough rather deeply, ten or twelve inches: the land endures drouth better when thus handled than when shallow ploughing is practised. Many of them run a subsoil plough after the common large plough every second year, to loosen the subsoil. To make the land mellow and fine enough for most

garden-crops, it should be harrowed and rolled after ploughing, and then ploughed, harrowed, and rolled again. The roller is an indispensable tool in the garden, and is most useful in packing the surface of the soil just enough to prevent excessive evaporation in time of drouth. For this purpose it is often made to follow the cultivator in the celery-field in dry weather.

Weeds have little chance to be very troublesome in a well-ordered garden. The continual hoeing and ploughing kill the few that come up, and no skilful gardener will suffer them to go to seed on his land; and the manure is suffered to ferment before being applied to the land in order to destroy the seeds it always contains. The only very troublesome weeds are those which grow and mature their seeds very rapidly, such as purslane, chickweed, and the like. Even these will yield to thorough culture.

Market-gardens have not as yet been irrigated to any great extent in Massachusetts. Some of the most successful gardeners of Arlington apply water only to their hot-beds and early cucumbers: a few of them use the large hose, however, in the field to water their early cabbages and lettuce, and late cauliflowers and celery in time of drouth. And there are some who water their strawberry-beds with profit.

There is good reason to believe that this practice is profitable and likely to increase: in some seasons the rainfall is sufficient for the growth of vegetation; but we often get a month or six weeks almost rainless, with hot, dry winds, very trying to the succulent vegetation of gardens. When water is applied, it should be put on in sufficient quantity to thoroughly soak the ground to the depth of the roots; and, as soon as it has soaked in, the land should be cultivated or hoed.

Frequent sprinkling of the surface is objectionable: it makes a crust upon the surface, and draws the tender rootlets to the surface, where they are likely to dry up if not constantly watered. To water land effectually requires an inch in depth applied every five days, or twenty-seven thousand gallons per acre. To apply this amount of water with an inch and a half hose and a head of forty feet would require about seven hours. If a three-fourths-inch hose were used with the same head, it would require about six times as long to apply the same quantity. Where water may be cheaply had and ap-

plied, there is little doubt that it will in many cases well repay the trouble. But, wherever it is applied, the land should have good drainage: otherwise a heavy fall of rain, coming after an artificial watering, might injure the crops. The land, if heavily manured and thoroughly tilled, will endure drouth pretty well without watering. Water, however, is indispensable to the management of the hot-bed and greenhouse; and many gardeners not within reach of public works, or a natural head, have found their account in erecting private water-works driven by a windmill or small steam-engine.

In no particular is the skill of the gardener more conspicuous than in the raising or selection of his seeds. It is well known that the seed-store is in general the last resort, and often the source of bitter disappointment and serious loss. In making this statement I would not be understood as casting any reflection upon the character of the seedsmen: they are many of them most reputable and honorable men, for whom personally I entertain great respect. The trouble is not with them so much as it is with the buyers of seeds, who are not willing to pay the price for good seed which it costs to raise it. The care required to produce really good cabbage-seed, or lettuce-seed, or onion-seed, would not be repaid by the prices which these seeds command in the market. The result is that the best gardeners raise their own seed for their own use, or for exchange with such neighbors as they can trust to raise for them some other variety. Of course this is attended with great trouble and expense; but it is the only sure way of receiving the full reward of one's labor in a very laborious calling.

Another most important part of the business is the washing, packing, and assorting of the crops for market. This is usually done under the eye of the gardener himself, or only intrusted to some experienced and trusty man. It is an old maxim of trade that goods well put up are already half sold. In no trade is this more true than in the vegetable and fruit trade: clean, neat, well-washed, attractive goods always sell quickly, at good prices; while carelessly prepared stock, that is really as good, will be hard to dispose of at a fair price.

The wash-house, provided with tubs, convenient benches, and sufficient shelter for the preparation of the crops for the market-wagon, is the necessary appendage of every market-

garden. Upon the convenient arrangement of this department much of the economy of the labor of preparing the crop depends.

There are some problems connected with the management of the market-garden which need investigation by scientific as well as practical men. One of these is the nature of the disease in the cabbage family known as "club-root:" its appearance is too well known to need description, but its nature is little understood. It is the practice of gardeners to plant the cabbage only one year in three or four upon the same land in order to avoid this disease; but in the year when the land is cabbaged it is often made to carry a good crop of late cauliflowers after the cabbages, which could not be done the year following.

Another question which is little understood by the gardeners is how to prevent mildew in the lettuce-beds: we are altogether in the dark in regard to its nature and the causes that produce it, and are very much at its mercy in raising lettuce.

The use of artificial fertilizers also needs to be more fully tested: it seems highly probable that the root-crops could be grown with greater profit by using a moderate dressing of manure combined with a potassic fertilizer, than by using the usual heavy dressing of manure alone.

The practice of irrigation, too, needs to be more generally tried. Those farmers who have used water most, are confident that it is profitable to continue its use upon field-crops, even where its application involves considerable expense.

The question is often asked, "Is not market-gardening a very profitable business?" There is no doubt that many skilful men have found it so; and it is equally true that many not so skilful have had to toil very hard at it for a living, and that others have lost money and grown poor in attempting it without proper preparation. The labor and care required for success in gardening are more incessant than in other kinds of farming: the gardener gets little respite from his cares, either in winter or on Sunday. And if he sometimes makes money faster than his brother-farmers who depend on their cattle, he does it at the sacrifice of a good deal of comfort and by dint of much care and hard work.

I thank you, gentlemen, for the kind attention with which you have listened to my very imperfect attempt to explain the market-gardener's work, and hope you will hear from some of the many more experienced and better gardeners whom I see around me.

The CHAIRMAN. Gentlemen, the subject is open for discussion. We shall be glad to hear from any one.

Mr. GEORGE HILL of Arlington. I think Mr. Philbrick has been over most of the ground very successfully: I don't know that I can add any thing. He has been very successful in his forcing-houses. He has got up something new, altogether different from any thing we have had in the way of hot-beds. I think he has made a great improvement in that direction. I should like to have him go on and explain further in regard to the construction and management of his green-house, rather than say any thing myself. As for market-gardening, I think the chairman is the man to speak on that subject. He is the most successful of any man in the county.

Mr. FLINT. If Mr. Pierce would state to the audience what crops are most salable, most desirable to raise for the Boston market, and some facts in regard to the best methods of raising those crops, I am sure it would be very instructive and interesting to a great many here who are not so well posted in that particular department of activity as he is.

Rev. Mr. SMITH. I would say that I visited Mr. Pierce's farm a few days ago, and found him in his house for preserving spinach and squashes; and I would suggest that he tell us something about that.

Mr. PIERCE. Mr. Philbrick has explained all those things. Almost every one I know here has a spinach and squash house of his own. As far as the question as to what crops are most sought for in the market is concerned, they vary with me every year. Some years I do very well: but, if I do exceptionally well one year, it is more than probable that the next year that crop will not pay; too many will go into it. My practice is to raise certain kinds of vegetables, and keep it up year after year: sometimes they sell well, sometimes they do not. I think there is very little money to be made in raising early cabbages, and putting on fifteen or twenty cords of

manure to the acre, and selling them at two cents a head. There is a great deal of profit in raising lettuce, if you can sell it for two dollars a dozen; but the trouble is to find anybody to buy it and pay such a price. As for the question, whether market-gardening is overdone or not, I do not know that it is. Every thing sells, but at very low figures. The price of manure ought to be lower, and the price of labor. I think Mr. Philbrick was very modest in his statement in regard to the amount of capital required in market-gardening. I should think it would take a good deal more than he said to carry it on successfully. I think it pays but a very small per cent upon the amount of capital invested. I do not know that it is overdone; but there is not near so much money made in it as there was a few years ago. The price of manure is too high; as for patent fertilizers, with me, or any man whom I have ever seen, they do not amount to any thing. I have spent considerable money on them; I have read the certificates of men in whom I have great confidence as men of intelligence, successful men, men who commenced with nothing, whose fathers did not leave them a farm or give them one, but they commenced poor men, and have worked and earned for themselves good farms, — I have read the certificates of such men, that they have applied such and such patent fertilizers, and have secured good crops; but I see that their manure-teams still continue to go on the road; they do not give up any of their stables; and I cannot buy manure for any less than I could years ago. I do not believe that any of them have given up a single stable, and used patent fertilizers instead.

Mr. Murray. I never knew such a thing as a spinach-house in my young days. I used to be very successful in preserving spinach through the winter, but not in the mode that is recommended here. I used to prepare, about the 1st of August, a number of cold-frames; and I had a very rich compost prepared, — one-half manure with decayed oak-leaves, — and I used to fill my cold-frames with that compost; and about the middle of August I would sow my spinach, the broad-leaved variety. I used to get an enormous growth: every leaf would be nearly as big as an early cabbage-leaf. I used a little of it in the fall, but always kept a very heavy crop until winter. I waited until the dry frosts set in; and

then, when the ground got perfectly dry, I had a lot of dried oak-leaves, and I used to put eight or ten inches of dried leaves over the spinach. Then, of course, when I saw an appearance of rain, I used to put shutters over it. I had shutters that I used instead of sashes. Of course I used sashes when I sowed the spinach, and took care of it. The board shutters kept it perfectly tight, so that no water could get through; and in mild days in winter I could take one of those shutters off, scrape the leaves off, and get a bushel of spinach any time I wanted it, and immediately cover it up with leaves again, and put on the shutter. I never had any difficulty in keeping spinach without erecting a house for it.

Mr. PIERCE. The gentleman just up has reminded me to say that his mode of keeping spinach is a capital one; but farmers, if I understand it, who raise spinach, do it to make money. The price of spinach is about half a dollar for three bushels; and it would not pay to raise spinach in any such manner, and sell three bushels for half a dollar. I have got five or six hundred bushels which I could afford to sell now at the rate of three bushels for half a dollar, and make a pretty good thing of it, by keeping it in a spinach-house. If it was raised in the fall, it would be nicer and fresher; but, at the ruinous prices we get now, I do not think it would be a profitable business.

Mr. WARE of Marblehead. Having occupied the time last year on this same subject, I came here hoping to hear from others, and did not expect to speak. But there have been one or two inquiries with regard to the subject of mildew. It is a subject of very great importance to the farmers and to every one else. It is one, perhaps, not fully understood; but I have watched, to some extent, the operation of this mildew, or fungus-growth, and what little observation I have made I am very happy to present to this meeting, not in a scientific way, however; and our friend Mr. Flint has just told me that we are to have a scientific gentleman present that subject at some future time during these meetings. I did not know that; but I will say a few words, if you please, upon the subject of fungus-growth upon vegetables. The potato-rot, that has so long been a source of trouble to us farmers, is, without question, the result of this mildew, or fungus-growth; and I have observed the opera-

tion of it for so long, that I think I can tell with certainty, if we have certain conditions of weather in summer, when the potato-crop has reached a certain stage of growth, that the potato-rot will take place forthwith. It requires, as I have observed, a mild, warm state of the weather, after a shower, — such weather as we farmers call "scalding weather." Probably every one here understands that. When the potatoes are in blossom, or have just gone by the stage of blossoming, and are growing very vigorously, if we have a spell of moist weather, or if, after a shower, the weather is warm and close, very little air stirring, the conditions are favorable for the potato-rot or fungus to take hold of the plant. I believe that the air is filled with the spores, or seed, of this and other varieties of fungus most of the time; and when the conditions are right for the propagation of those seeds, then they take hold and grow. That, to my mind, is the cause of the potato-rot. Sometimes it affects the early crop. When the early crop is in a condition such as I have stated, and the weather is such as I have described, the early crop will be affected by the potato-rot; but, if we do not happen to have such kind of weather at the peculiar stage of growth of the potato, we do not have the potato-rot at the early season; but it may come later, and affect the later growth of potatoes, depending upon the condition of the growth of the potato-vines and this peculiar kind of weather.

We have another fungus that troubles our farmers very much who are in the habit of raising onions. It is called, among farmers "smut." This operates quite differently from the potato-fungus, that affects the potato, and causes it to rot. The spores of the onion-smut will infect the whole soil of the onion-field. It is very rapid in its propagation; and we find sometimes the land infected with what we call the "onion-smut." There is no remedy for it that I know of, except to refrain from raising onions on that land for three or four years, for this fungus will remain in the ground certainly two years, and very likely three; and it is carried from field to field by the implements that may be used. The ploughs, harrows, rollers, and drags that are used on the onion-field are impregnated with the spores of the onion-smut, and it is transmitted from field to field in that way. It is wonderful how long the spores, or seed, will retain their virtue, — three

or four years, as I have said. The only remedy I know of is to discontinue raising onions on that land, and take another piece.

In regard to the fungus that affects the hot-beds in which lettuce, &c., are grown, I will say, in the outset, that I have had very little experience with hot-beds; but I should judge, from what I have observed of fungus-growth and the propagation of its seed in the case of the potato, that the cause of fungus in hot-beds is too much moisture, with too little ventilation. But I ought not and do not undertake to instruct these gardeners in the management of their hot-beds, because they have had very much more experience than I have. It is simply suggested to my mind, knowing the conditions under which the fungus-growth affects the potato, and produces the potato-rot, that similar conditions, which might and probably would be found in hot-beds, would be just the conditions for the propagation and support of the fungus that affects lettuce and similar plants.

The gentleman who favored us with the very valuable and instructive paper on market-gardening, in mentioning the implements used, spoke of the roller. I have no doubt he finds it a great advantage; and I judge, from what he says, that it supersedes the necessity of the use of the garden-rake in the preparation of the ground for garden-crops. Many of the farmers in Essex County use, instead of the roller, a drag. I described that drag at the meeting a year ago quite fully. As far as my own experience and observation are concerned, it does better work than the roller, from the fact that the roller, if the ground is lumpy, will oftentimes press the lumps into the ground without crushing them; and the drag, on the contrary, grinds the lumps all up, and completely pulverizes the surface: therefore it has been the practice of our farmers in Essex County to use the drag in preference to the roller for a good many years. I find it one of the most important implements I have on the farm. I do my first hoeing of potatoes, corn, pease, and almost every crop, except the finer garden-crops, with the drag. Just before those plants are ready to break the ground, the weeds have made their appearance on the surface, and, by going over the field with the drag, it just breaks the crust, and kills every weed that has started, and does not affect or

interfere with the coming crop that is not up; so that, in that way, the first growth of weeds is destroyed with very little trouble. You can go over an acre of ground with a drag which will drag a space eight feet wide in a very short time; and it does perfect work, and leaves the ground in very nice condition for the coming up of the crop that is to follow.

I did not intend to take the time of this meeting. I know there are men here of very great experience and wisdom in the growing of these crops. I wish they would tell us the facts that they know. We farmers generally, in our experience, get hold of something that our neighbor does not; and some of us, perhaps, keep it to ourselves, while others are very willing to enlighten their neighbors. Now, at this meeting, if any of my brother-farmers have got something that they have found out, although it may be worth dollars to them, I hope they will let us have it.

Mr. Murray. I would like to inquire if the gentleman ever tried air-slacked lime to destroy smut on the onion-crop. I have tried it myself, and have always been very successful, putting on a good coating of air-slacked lime before the onion-seed was sown. I have seen it done even as long ago as when I was a boy.

Mr. Ware. I have had no experience in that particular.

Mr. Hill of Arlington. I heard Mr. Ware's lecture last winter, when he made the same statement that he has made to-day, — that it was not safe to undertake to raise onions upon a field where the smut had made its appearance. I had one corner of a large onion-field that was infected with smut last year; and, on listening to him, I thought I could not raise any onions there. But I put in the seed this year, and I did not see one leaf that showed any symptom or sign of smut. I had as good an onion-crop as I ever had. I think it must be something peculiar to him. I supposed I should have no success the present season; but I had a good crop where it was almost a perfect failure the year before on account of the smut.

In regard to mildew on lettuce: I do not think that is accounted for by the condition of the weather. We used to go through the same kind of seasons when we raised lettuce years ago as we do now, and I think we used to cultivate it in the same way; and for years I never saw any signs of

mildew. I do not think that the changes of weather have any thing to do with the potato-rot. We must have had the same peculiarities of climate and weather that we have now, as long ago as when I was a boy, when the potato-rot was unknown. I think the gentleman is entirely wrong in his theory.

Mr. Wetherell of Boston. I rise to ask a question of Mr. Ware touching the potato-rot; and I wish to give a fact on which I predicate the inquiry. A farmer in Hadley told me that he raised a crop of potatoes in this wise: one half the field was manured with barnyard-manure, and the other half with the stems of tobacco, cut up, and used as manure in the hill; and the part where he used the manure rotted badly, while the part where he used the tobacco-stems did not rot at all: and, inasmuch as the same atmosphere overhung both sides of the field alike, if it was filled with spores, as we are told, why did not the spores affect the crop where the tobacco was used, as well as the crop where the barnyard-manure was used? And, furthermore, I would ask the gentleman whence come those spores that he speaks of, that float in the atmosphere.

Mr. Ware. In the first place, I will suggest an answer to Mr. Hill. I know, that, a number of years ago, the potato-rot was not known in this country. The probability is, that the variety of fungus that produces the potato-rot had not then been introduced into this country. It is a vegetable growth; and there are a number of varieties of fungi, and that peculiar variety which produces the potato-rot very likely had not been introduced into this country at that time. With regard to the crop of potatoes, where one part was planted with tobacco, and the other with manure, I would like to know if the gentleman knows that both parts of the field came forward alike. Did the manure force the crop along a little more rapidly than the tobacco-stems, or did the tobacco-stems force the crop to come forward a little before the manured part? If there was any difference in either coming forward, when that part of the crop that was manured with barnyard-manure was in just the right condition, probably we had the kind of weather that was particularly adapted to the propagation of the spores that produce the potato-rot. If that was not the case, I can only say that I suppose tobacco

is just as repugnant to the spores of the potato-rot as it is to me.

Mr. WETHERELL. I have only to say, in reply, that both parts of the field were just about an even thing in their growth; so that I do not think there is any force in that suggestion.

Mr. W. C. STRONG of Brighton. I rise, not because I pretend to know much about mildew; but I wish to express my pleasure that Professor Farlow is to lecture on this subject. I believe that he will be able to give us a good deal of information, and that the members of this Board will profit very much indeed, if they will remain to hear that lecture. I think, after hearing that lecture, they will doubtless have different opinions in regard to the potato-rot, and upon this subject generally. I think it is one of the most important subjects that is now arresting attention. I think that mildew, or fungus-growth, is very much more extensive than we have any idea of. It is not limited to the potato; it is not limited to the lettuce and onion, and the other things that have been alluded to this afternoon; but it extends throughout the whole vegetable kingdom. We shall find that our forest-trees are being injured year by year by fungi. I have no doubt whatever, notwithstanding what has been said, that the potato-disease is caused by a fungus, and that the blight or rot of the potato comes from the same cause. I think that Professor Farlow has made it clear almost to demonstration that the two are connected, and are caused by parasitic growth. The more recent investigations, in regard not merely to the vegetable kingdom, but to the animal kingdom, show that fungi are the cause of disease and death, not only in the vegetable, but in the animal kingdom. The germ-theory of disease has now become an accepted theory; and we are inclined to believe that most of the contagious diseases to which humanity is exposed are caused by fungus, vegetable growths.

So far as I have had experience with fungus-growths, I have found that sulphuric-acid gas is almost a sovereign remedy. In the green-house the use of sulphur in various forms, dissolved in lime, or in the form of a mild gas, — that is, not sulphuric-acid gas, but the mildest form, — is almost a specific for mildew upon grapes. It will arrest the growth of this

fungus upon the leaves, and destroy it completely. I believe that experiments have proved that the use of sulphur is one of the best remedies that can be devised. In the open vineyard, it is well known that dusting the foliage with sulphur, or syringing the foliage with diluted sulphur-water, sulphur dissolved by means of quicklime, is a remedy. I think, in various instances, sulphur is one of the very best remedies. In the propagating-bed, when the sand becomes impregnated with the spores of fungus, it is a good plan to dry the sand thoroughly, to bake it, and so exterminate all the seeds of this minute vegetable growth. If we had instruments by which we could examine more carefully, we should find that our vegetables and our plants are infested with fungus-growth oftentimes when we suppose they are perfectly healthy. I was surprised this year to notice upon the leaves of a pear-tree, apparently perfectly healthy, the minutest fungus-growth, developing rapidly, and probably causing, very soon after, the blight with which we are all familiar. I would not say "very soon after." I think it may exist a considerable time before we are aware of it. I know that this growth is upon our coniferous plants as well as upon our broad-leaved plants.

Before I sit down, I again wish to urge the members of this Board to be present at the lecture of Professor Farlow. I have no knowledge of what his theme will be; but I am sure that it will be a profitable one, because I am very confident he is one of the most promising scientific men of the country, and I think he will, at the present time, rank among the very foremost observers of the world.

Question. The gentleman speaks of dissolving sulphur with quicklime. It strikes me that must be a very good thing, and I would like to ask him what proportions he uses.

Mr. Strong. I am sorry that I am not able to state the exact proportions. I usually take a peck of quicklime, with from one to two pounds of sulphur. That will give a very strong solution of sulphur, which is diluted by a considerable quantity of water. I am sorry I am not able to give the proportions. I do it by my eye, and judge of the strength. It is possible to burn the foliage with a very strong solution of sulphur; and yet I have never found any difficulty. It is a very inexpensive remedy. I have used it freely in the open

vineyard, syringing an acre of vines with this solution, and have found it produce a most important effect, though, of course, the seeds are propagated with wonderful rapidity, and in favorable weather the mildew is continued, and it will be necessary to make repeated applications; and, even then, I do not say it is a sovereign remedy.

Mr. MURRAY. In regard to the preparation of sulphur with lime: I have used it for a great many years, more than forty years, at least; and I will state to the gentleman exactly how I have always prepared it. I take about half a peck of flour of sulphur; then I go and get quite a large lump of lime, a solid lump, probably as much as would go into a half-peck measure. Without breaking it at all, I lay that in the centre of the bottom of a tub that I always keep for that purpose. I then take half a peck of sulphur, and lay it exactly over the lime, covering it all up. I then pour a pail of boiling water gently over the sulphur and lime, and it immediately begins to boil. I keep doing that until I have used three pails of boiling water; and the moment the third pail is put on, I commence stirring it with a stick, and continue stirring it until every thing is completely dissolved, and nothing is to be seen on the surface but the clear liquid. Then, after it has cooled, I always strain the liquid, and put it in either a glass or stone jug, — glass is decidedly the best, — and cork it tight. When I want to use it upon grape-vines in the house, when there is an appearance of mildew, I take about half a pint of that clear liquid, and put it into a common water-pail of water, and syringe the vines with that; and, as Mr. Strong says, I will guarantee a perfect cure for mildew. It immediately vanishes. It is a very simple thing; but very few people seem to understand how to prepare it. I have prepared it so often, that I feel perfectly capable of giving an explanation to any gentleman here who has never used it. I have kept it several years, and it was just as good at the end of four or five years as it was the first year.

QUESTION. I have been very much pleased with the answer, and I would like to ask another question. This year, and every year, my cabbages have been covered with a sort of bluish-colored insect. I would like to know whether this liquid would be a remedy for that trouble. It looks

very much like blue mildew; but it is a little insect, sometimes called a louse.

Mr. Strong. I think the two things are as wide apart as the vegetable and animal kingdoms. I do not think there is any relation between the fungus of vegetable growth and animal growth. I have no reason to suppose that sulphur would be injurious to the animal growth, though it may be fatal to the lower forms of vegetable growth. I know it is fatal to the higher forms of vegetable growth, when it is applied in the form of strong sulphuric acid; and a very weak solution of sulphur is destructive to very low forms of vegetable growth; but I am not aware that it is so to animal growth.

Mr. Ware. I judge, from what the gentleman says, that the cabbages he alludes to are infested by what farmers call "lice." They are what we call the "large aphis." A strong solution of salt sprinkled over the plants will remove them. It is some trouble to do it; but I believe it is a remedy.

The Chairman. We have here a gentleman from Arlington, Mr. Rawson, who has the reputation of being one of the best market-gardeners in that town. Perhaps he can give us some information on this subject.

Mr. Rawson of Arlington. I am not very old in the business; but I was brought up in it, and I do not know any business except the vegetable business. But still, what information I could give you in this meeting would not be of much benefit perhaps. I might talk to each of you individually, and give you, perhaps, a great deal of information; but I cannot express myself before a large audience as I should like to. Still some questions have been asked which I can perhaps answer. One is, "Does vegetable farming or market-gardening pay?" I say it does: that is, I have made it pay; and, as long as I have, I think anybody else may. Another question is, "Is it overdone?" I do not think it is: I do not think it ever will be overdone. I think we can improve all the time; I do not think any man is too old to learn something: but still, as I said before, I cannot tell you any thing that I think would be of any benefit to you at this time.

Mr. Strong. I would like to ask him how he makes it pay.

Mr. Rawson. In the first place, I have but one business. In the second place, I always get up in the morning, and attend to my business. That is one way I have made it pay.

Mr. Smith. And you put some brains into the work too?

Mr. Rawson. I put in what little I have. I have been brought up in the business: and, if I cannot make it pay, it is my own fault; because I haven't brains enough, I suppose. I have not a great deal of land, — only twenty-five acres. An account of my farm was published in "The Massachusetts Ploughman," and I suppose some of you have read it. I can say that every word in "The Ploughman" is correct, and more too.

Mr. John Fillebrown of Arlington. I have used fertilizers to some extent. I have used the Bradley Fertilizer more than any other. Year before last I ploughed about three-quarters of an acre that had been lying four years without any manure, badly run out, neither grassed over nor weeded over. I ploughed it about the first of August, rolled it, harrowed it pretty thoroughly, and put on two barrels of Bradley's Fertilizer, — less than four hundred and fifty pounds, — and sowed it with white turnips; and I would not ask a better crop than I got from that piece of land. At another time I raised an acre of white turnips on a very small quantity of guano, and it was the best crop of turnips that I ever saw grown: I won't except any crop. I don't know just how much guano I put on; but it was a very small amount. I would like to hear some gentleman say something about fertilizers. I used this year more than a ton of the Brighton Fertilizer upon celery, and I think it paid me very well for using it. I have used it on cabbages; I have used it on cauliflowers; and I think it paid me well.

Mr. Atwill. Mr. Fillebrown speaks of raising large crops of turnips with fertilizers. I claim that his land is so filled with manure, that, if he did not put on any manure at all, he would get a splendid crop of flat turnips. It is my opinion, that a man living twenty miles from Boston, who should go to raising general crops without manure would soon have to move from his farm. If a man has any money to invest in manures, I think he had better invest it in stable-

manure. I know there is greater expense involved in handling stable-manure than in handling fertilizers; but two hundred dollars will buy a great deal of stable-manure, and it will pay for the first cost of it. Two hundred dollars will buy but a very small quantity of guano or any other fertilizer of that kind. Very few of us can afford, in my opinion, to buy these fertilizers. If we have our ground filled with manure, and wish to force a crop very early, then an application of a good fertilizer might be advisable, because the crop could be sold in the market for a price that would warrant the outlay. But that is the only way in which I can imagine these fertilizers will pay the common farmer.

Mr. Philbrick, in his remarks, separated the farmers that live within six miles of Boston into one class, and the farmers that live from seven to fifteen miles from Boston into another class. I happen to live about fifteen miles from Boston. He stated that the crops on farms from seven to fifteen miles from Boston average about five hundred dollars an acre. I live at the limit, fifteen miles; and therefore I should expect five hundred dollars per acre. I have not received that amount; and therefore I think part of it must apply to those nearer Boston, — seven or eight or nine miles.

I will state that the growth of small cucumbers for the pickle-business has been as profitable to me as any crop I have raised; but the day for pickles being profitable has passed. Years ago we used to get from fourteen cents to twenty cents per hundred. Twenty cents we considered an extreme price; and I never realized that on a contract, except one year. There is something to be made on them at that price. Now the price has been reduced to about a minimum of ten or eleven cents a hundred. The expense of raising them is much less; but it leaves very little, if any, margin for the farmer.

I would like to ask one question in regard to squash raising. I have had considerable trouble in raising squashes. When the squashes have formed, and sometimes when they have grown as large as one's head, the vines die. There seems to be no remedy for it. My experience is, that the only way to prevent it is to plant the crop late. When I have planted the seeds from the middle of May to the 1st of June, I have found that my crop has been a failure; but,

if I wait until about the middle of June, sometimes I have had a fair crop.

Mr. Fillebrown. I think I distinctly stated, in regard to the land to which I applied Bradley's Fertilizer, that it had had no manure put upon it for four years. It was land adjoining mine, that I hired. I have raised, I think, a better crop of cabbage on ground to which I applied the fertilizer than where I used horse-manure. I first manured the ground with night-soil spread on broadcast, cultivated it in thoroughly, and I then furrowed the ground, and on that portion I put in a lot of good horse-manure just drawn from the stable, and on the other portion of it I put the fertilizer, treating it all in the same manner as to cultivation. I think where I put on the fertilizer, which did not cost me more than half what the horse-manure did, the crop was equally good; and sometimes, when I have looked at it, I have thought it was better. The ground was staked off, so that I knew exactly where the fertilizer went. I would like to hear some gentleman who has had practical experience in using fertilizers.

Mr. Whittaker of Needham. I have noticed that a number of gentlemen who have spoken have compared the prices of vegetables now with what they were some years ago. Do they refer to the time when the gold dollar was worth about two dollars and a half of paper currency? If they do, probably the gold price of vegetables is about the same as it was then. We must bear in mind that every thing has been going down and down in value. As our paper currency has appreciated, other articles have gone down. Market-gardening has shared the same fate as every thing else. There is not a commodity to-day that is sold, that the seller does not complain of the lowness of the price. Let us take the prices now, compared with the prices in 1860, and see how we shall stand then. I should like to have some of our friends who were selling these vegetables in 1860 tell us how the prices to-day compare with what they were then.

Mr. Philbrick. It is time this side of the house called upon the other. The chairman is a practical farmer. There is no man on the Board who is listened to with more attention. I hope we shall hear from him before the close of this session.

The CHAIRMAN. I am in market-gardening only in a small way. I grow two or three crops pretty largely for market, — asparagus, onions, cauliflower, and a little of some other things, but those more particularly. I grow them because I have been studying how to grow some things, and I believe I can grow them better than I could some years ago. I have learned how to grow them on my own land. I could not tell you how to grow them on your land, because your land is entirely different. I have learned this, that while I use stable-manure, and make that the basis for growing these crops, it is for my interest to use something else as a special manure in addition to that. For instance, I had an acre of onions, — as good an acre of onions, certainly, as there was around in my section, — the best I ever grew, although I have grown good crops of onions uniformly for the last few years; but I suppose that Mr. Hill or Mr. Rawson, if I had told them, before this meeting, that I sowed nine pounds of onion-seed to the acre, would have said that I should have had nothing but small onions. I rather thought so myself. It was an accident that I came to sow them in that way. I lent my seed-sower to a neighbor, and, after he returned it, I used it; and, when I had sowed about a quarter of an acre, I found the seed was going out pretty fast, and, upon examining the machine, I found that some person had reamed out the tin with a jack-knife, instead of changing the tin. I felt very much like making some hard remarks; but I suppressed those as well as I could, because there was no one around to hear, and there was no use in making any fuss. I went to work and changed the tin; but still I was thrown out so, that I did not know how to regulate the machine as I wanted to; and, when I got through, I found there were nine pounds of onion-seed on the acre, when five was all I wanted. The seed was good: it all came up, and looked as though it was thick enough for onion-sets. We weeded it once; and, when we came to weed it the second time, I said to my son, "I guess we shall have to thin these onions." I tried it about ten feet, and found there was work in it, and said, "I guess we will let the onions go. I think I have got enough manure under them to lift them out, if there are nine pounds of seed on the acre." When I harvested them, I found there were two, three, or four onions piled on top of

each other; and, instead of being small, they were larger than I should suppose anybody would want for market, although the large onions will sell best, after all, though they are not so good. One of my neighbors directly across the ditch, on the same sort of land, sowing his onions the same day, and applying the Stockbridge Fertilizer to his field, which I did not, did not get a quarter as many as I did; and his were all small. I could account for it in no other way except by the special fertilizer that I applied for onions. There were some eight hundred bushels. Of course Mr. Ware would say it was only an ordinary crop of onions down in his section. There were some rows saved for celery, which was not good for much. It was pretty good the 1st of July; but the 1st of September it was not so good. I was only sorry that I did not sow onions on the whole field, because I have no doubt that the onions grown on the same ground would have netted me much more than the celery did.

QUESTION. Will you tell us what that special fertilizer was that you used?

The CHAIRMAN. I used sulphate of potash.

QUESTION. In what method?

The CHAIRMAN. It did not come along quick enough, so that I could put it on when I prepared the ground: so I sowed it immediately on the top of the ground.

QUESTION. No harrowing in at all?

The CHAIRMAN. No harrowing in at all.

QUESTION. What quantity?

The CHAIRMAN. One thousand pounds to the acre. I have learned better than to expect to raise a large crop on nothing. I can't do it.

QUESTION. What amount of seed did your neighbor use?

The CHAIRMAN. He sowed the same kind of seed. I got the seed for him. His was sown too thick, but not so thick as the first of mine. The first quarter of an acre of mine was a good deal thicker than the rest. I suppose if I had not put on the potash, I should have had small onions. I suppose every market-gardener, and every farmer, knows that there is no better fertilizer for onions than wood-ashes. Well, it is simply the potash that is the important thing for the onions: therefore, as I said before, I endeavor to supply

plenty of manure to start with, and then a sufficient quantity of the fertilizer adapted to the special crop that I am going to grow; and the question as to what fertilizer is adapted to the crop must depend, I think, upon the farmer himself. Knowing his land, and following what Professor Goessmann and the chemists tell us of the wants of the different crops, he must judge of that himself, and buy those fertilizers in a crude form, use them, and find his own brains. I do not know any other way. No man can do it for him. I do not believe you could have it done even by Professor Goessmann, who is, perhaps, the most talented chemist, certainly in the agricultural way, that there is in Massachusetts, to say the least.

QUESTION. Are you able to tell us whether you made any money on those potatoes that you carried into Boston, and sold at seventy-five cents a barrel?

The CHAIRMAN. I got as much as anybody did. I found other persons did not get as much as I did, and went home perfectly satisfied.

QUESTION. Did you make any money out of it?

The CHAIRMAN. I did not.

QUESTION. Did you make any money on the butter you sold for twelve or thirteen cents a pound?

The CHAIRMAN. No; but I had to take it.

QUESTION. But you laid the foundation for making money?

The CHAIRMAN. It taught me better than to sell in that way.

Mr. COOLIDGE. There is one thing I wanted to ask during this discussion, when the gentlemen were talking about mildew on spinach and other crops. I have been afflicted severely the last two or three years with a disease among my spinach, very much resembling, in my judgment, the mildew on lettuce, although I can discover nothing that looks like mildew. I have got a great deal of spinach sown, and that which I sowed earliest, with the intent of cutting and harvesting it for winter use, looks as it will sometimes in the spring of the year, only a good deal whiter. Three-quarters of it, I think, is dead, to all appearance. It commences to turn yellow after it gets through its growth; and the trouble increases on the early-grown spinach until it is entirely

destroyed. I have got from half to three-quarters of an acre that is worthless, apparently, that I intended to harvest for winter-marketing. Supposing, at one time, that the difficulty could be obviated by sowing later, I tried the experiment; but I find the same trouble on the spinach that is barely up. If any gentleman will tell me what it is, and what will prevent it, it would gratify me very much.

As to instructing anybody, I am in the same condition as Mr. Rawson. I cannot tell any such story as that in the "Ploughman," about my farm; but I have one satisfaction, — when we get together Thanksgiving-day evening, there is a good crop in the house. I have got that; and, if it is worth nothing to anybody else, it is worth very much to me.

Dr. Wakefield. I have had some experience in years past; and I gave the result last year of some considerable number of experiments made on roots with different kinds of fertilizers compared with barnyard-manure.

I have satisfied myself on this point, from my experience in years gone by, — that every farmer should husband his barnyard-manure, and make, from every possible source that he can, additions to his manure-heap. He should not lose any thing because fertilizers are cheap, or because he can hasten a crop, and bring it to maturity by them alone. I believe experience has taught me this, — that, having saved and utilized all his manure, any farmer can use fertilizers to advantage. I have no doubt, indeed I know from experience, that many of these fertilizers do not possess the properties which they are stated to possess, and they are failures; but I believe that the principle enunciated by the professor at Amherst is a correct one, — that each crop takes out from the land certain ingredients, and that those have to be furnished, if they are not in the land. Soils contain a certain amount of the ingredients which every crop takes up; but, if the land has not enough of them, — and no land within my knowledge has enough of them to last forever; the prairie-lands of the West, or the rich bottom-lands of Massachusetts, will not stand cropping forever, — they must be supplied by man or nature. Take the wheat-lands of New York, which, when I was a boy, produced much larger crops than they do now; take the tobacco-lands of Virginia, which, years ago, pro-

duced that crop in exuberance, but which have now run out, — the crops grown on those lands have taken from them more of the special materials used by the crops than has been returned, or than Nature has furnished. That is the way with the crops here in Massachusetts. Massachusetts has not a soil which will bear cropping for any length of time without putting any thing on, and whatever is taken out should be annually restored. Now, Professor Stockbridge has shown us, by chemical analysis, that certain plants take out certain things. Barnyard-manure we all know from experience, and it has been taught us from our earliest boyhood, will produce any crop almost. If you have enough of that, you can use it, and add to it, as Capt. Moore does, a special fertilizer; so that, if you get your onion-seed three or four deep, it will throw them all up as big as your fist, one on the top of the other. If that nine pounds of seed had not found any more manure underneath it than most of us usually put in the ground, he would have had a crop of small onions; but he knew, having begun with selling butter at twelve cents a pound, that he had got to do something better than that. He has learned that. There is the great advantage of special fertilizers. I believe that every farmer can take his barnyard-manure, and then, if he wants a larger crop, he can afford to buy a fertilizer which contains those properties which the crop requires, and which are constantly consumed from year to year, and can thus make it pay.

In the experiments I made last year, comparing the crops produced by barnyard-manure with those produced by the Stockbridge Fertilizer, — such crops as onions, beets, mangels, corn, and potatoes, — the advantage was always on the side of the fertilizer, with one single exception. I cannot state the figures here; but you have them in the Report of last year. The advantage in regard to price and in regard to the amount of crop was, with one exception, in favor of the fertilizer. I did not try the experiment year after year, so as to know whether the effect of the fertilizer will continue. It was asserted last year at these meetings, that the corn-crop where this Stockbridge Fertilizer had been put in increased from year to year. I believe that was established as a fact. I thought there was evidence enough to convince me that that was true. Now I learn that this year it has

not come up to that. I do not know that it is a fact; but I have been told that the Sturtevants over in Framingham have failed in their crop of corn planted this year with the fertilizer. If that is a fact, every farmer in Massachusetts would like to know it. I supposed it was settled that we could use the fertilizer year after year, and the land would not deteriorate any more than it will if barnyard-manure is used in sufficient quantities to produce a good crop.

I was satisfied from the experience I had had, and from the experiments which had been reported at this Board from year to year by Professor Stockbridge and others, — and it was tried last year on thousands of acres, — that it could be used as well as barnyard-manure. Now, if it has proved a failure this year, so that the general principle which I had supposed to be established will not apply, we all want to know it. If anybody else has compared barnyard-manure with the special fertilizer this year, — whether the result coincides with my experiments, or goes counter to them, — I want to know it: every one wants to know it. What we all want to get at is the facts.

Mr. Paul of Dighton. I wish to say one word in regard to the raising of onions. I will say that I have attended the meetings of the Board now for six or seven years in succession; and, if any thing has struck me as I have been looking on, it has been that there is so much difference of opinion among farmers on every subject which is brought up. I was forcibly struck with that fact when the statement was made in regard to the quantity of onion-seed sown on an acre. I planted an onion-field this year; and, in my ignorance, I did not know that mice would destroy onion-seed. The seed I planted on a part of that field was exposed, and the mice got into them; and I think not quite half as many came up on that portion of the field as on the balance. On the whole field I put four pounds and a half; and on that portion of the field where not more than one-half of the seed came up, — that is, about two pounds to the acre, — there were more bushels of onions than on the balance of the field, where there were four pounds to the acre.

I would suggest one thing here, although, perhaps, it is a little out of place, in regard to those points where we differ so much; and it is the same thing that I heard Dr. Nichols

caution the farmers about at Fall River. He said there are some matters upon which farmers are agreed: let those rest; do not bring them up, and discuss them over and over again. The questions upon which we differ, of course, we must discuss in the future. There are some great questions in farming which we are all agreed upon: for instance, we agree upon thorough tillage. We agree also on the fact that a generous application of manures and fertilizers in some way is beneficial to the growth of crops; and we agree, that, on many kinds of soil, barnyard-manure is beneficial. I should have said, in the past, that it was agreed that the potato-rot was a fungus-growth; but it seems we are not quite agreed upon that.

I merely rose to say, that, upon that particular field, I raised six hundred bushels of onions to the acre, with less than two pounds of seed.

QUESTION. Have you been troubled with smut?

Mr. PAUL. No, sir.

Mr. PHILBRICK. I have here a scuffle-hoe, which differs from a wheel-hoe in that it has a flat shield instead of a wheel. This shield prevents it from running too deep, very much as the wheel of a plough does. It has a long handle; and a man can go through the rows of a small crop as fast as he can walk. It has also the additional advantage, that, when drawn back, it throws the weeds out better than a wheel-hoe.

The gentleman upon my right asked for information about his squashes, which he said troubled him after they got pretty well grown. It is possible that that may have been occasioned by the borer at the root. That is a thing with which we are very much troubled, and it is very much more apt to affect squashes that are planted early than those planted late. I know of no remedy, except that I have known some gardeners to cut out the root which is affected by the borer, and depend entirely upon the roots that strike down from the branches of the squashes. In this way they have got a partial crop.

QUESTION. Does Mr. Philbrick know the origin of the borer?

Mr. PHILBRICK. I do not understand any thing about the borer: it is one of those things that I hope Mr. Farlow will tell us about, or some other gentleman.

QUESTION. Will you tell us what to do with the black bug?

Mr. PHILBRICK. We put a shingle under every hill at night, and the bugs go under the shingle; and early in the morning we go round, and kill them with our fingers.

Mr. FILLEBROWN. I have had some experience in raising squashes; and the difficulty I have found with squashes is, first the yellow bug; and soon after that we find the black bug; and, when the weather becomes wet, we find green lice; and at the root, after that, we find the borers. They eat into and destroy the vine. Some years ago I discovered a fly that seemed to be pretty busy among the squashes; and I followed it until I saw it light, and saw it lay an egg at the root of the plant; and I soon found that the egg hatched out a maggot, or borer, which commenced to work at the root. These borers have increased very much in the last few years. Last year, if I had not attended to them, I should have had a very small crop. I went over the field, and cut them out with a knife. I think I cut out as many as twenty from one vine, large and small. Some would not be more than a quarter of an inch long, and some of them were an inch long. My boy, who worked with me, said that he cut twenty borers out of one root. You will find the eggs from the root of the vine, where it comes out of the ground, for three or four feet all the way along; and, as soon as they hatch, they commence to eat, just the same as a caterpillar, and, if you take them when they are very small, you can kill them easily.

Mr. PIERCE. I think I know what the borer is; but I would like to ask the gentleman if he does not know some disease that affects squash-vines. Sometimes, when my squashes have grown so that they will weigh six, eight, or ten pounds, the leaf will wilt one day, come up again at night when the dew comes; wilt again the next day, and in a few days it is quite dead; and, if the ground is covered with squash-vines, two-thirds of them will die, and there will be only a very small crop. I am very often troubled in that way. I don't know what it is. It is very easy to lay it to the borer; but that is not the thing which has troubled me.

Mr. FILLEBROWN. I have seen another insect which

bores into the root. You will find them with their heads in the root, and their bodies out. I have seen them a great many times.

Mr. Murray. About twenty years ago, when I built my house up here on the banks of Charles River, I planted a number of melon and cucumber hills; and I found, to my sorrow, that these black squash-bugs were making complete destruction of all my vines. I commenced to kill them; but the smell made me sick. I collected a lot of them, and poured boiling water upon them, and destroyed them in that way. I put shingles down under the vines, as Mr. Philbrick suggests; but I could not stand killing the disgusting insect. I thought if I lived another year, I would try another experiment, which I did live to try, and very successfully. I found that tobacco was very repugnant to these black bugs; and, when I found they did not like it, I went into Boston, and bought about a barrel of tobacco-stems from the cigar-makers, and took a quantity of those stems, and cut them up with a hatchet upon a block, as you would cut up hay to feed horses; and then I collected it all in a basket, and went to my melon and cucumber vines, and laid it about two inches thick all around my vines. I watched the process very closely to see what would be the result, — whether those fellows loved tobacco or not. I never had a better crop of melons in my life than I had that year. I had no trouble whatever with the black rascal. He never came near me; or, if he did, he kept out of my sight. It is a very cheap experiment. I think I paid half a cent a pound for all I wanted, besides the expense of bringing it up by express.

Question. I would like to inquire if there are any here who have had any experience in raising French turnips with the Stockbridge formula for turnips. I am a little one-horse farmer on the sands of Cape Cod, where we raise turnips. I manured a little piece with the Stockbridge Fertilizer, and they grew very well, and looked handsome; but, when I came to harvest them for market, I found they were worthless as a table turnip. They were watery, and tasted very turnipy. What I wanted to inquire was, if there had been any trouble in manuring with the Stockbridge Fertilizer for turnips. I do not know but the trouble was with the soil; but I am in doubt, and want information.

Mr. . I experimented a little with the Stockbridge Fertilizer this year on turnips, and I found the same difficulty as the gentleman who has preceded me. They were watery, while those sowed on manure were not. The outward appearance of the turnips was very much the same. I would like to ask Professor Goessmann if he can give any explanation.

Professor GOESSMANN. The Stockbridge Fertilizer contains no ingredients injurious to plants. It contains the elements essential to plant-growth; but, without knowing the condition of the soil and the specific treatment, it is very difficult to give an opinion in regard to any particular case.

Mr. HASTINGS of Framingham. I have a neighbor who came from Arlington, where he had cultivated a small piece of land as a market-garden for a few years. His land was very rich; and he used nothing when he occupied it but fertilizers of some kind, — no barnyard-manure. His land was in excellent condition anyway, without the fertilizers. He moved out into my neighborhood, and took some land that was ordinarily good farming-land, but had never been manured for gardening. I told him, when he commenced, that I did not believe he could afford to buy that land to raise vegetables on; but he thought he could. He had told me how much he had raised in Arlington upon a certain piece of land. I told him I thought he would find a great deal of difference between the land where he was and the land in Arlington. He talked with some of my neighbors who were carting stable-manures about a mile and a half, and he says, "You are carting eighty-five per cent of water. You might just as well throw that away, save your team, labor, and expense, and buy fertilizers." He went on with this market-gardening, using fertilizers of some kind; and he had very poor success. The next year he got barnyard-manure almost entirely, — bought it wherever he could, — and raised better crops than he did the year before.

Three or four years ago, I read so much in the papers about fertilizers, and how much could be raised by their use, that I thought I would try a few kinds. I got some of the Brighton Fertilizer, and then got something that they called German salts. I got also two kinds of guano, which I used, mixed with loam. I put them on about the first of June; and,

where I put the Brighton Fertilizer, it was not more than a week before I could see quite a difference. The grass looked greener than it did anywhere else. The next year I sowed some mangels, and dug in some of this Brighton Fertilizer with the other manure; and I got a great crop, although I did not weigh or measure to see how much there was. This year I planted some mangels on the same ground, putting on nothing but barnyard-manure, and the crop was very much poorer both in quantity and size; so that I think it will be a great help when the land is highly manured. I do not think it will do much, if any, good in raising a crop of vegetables or any thing else, unless the land is well manured before it is put on.

Mr. E. B. Smith of Waltham. I have thought that perhaps one trouble with our meeting this afternoon was, that the farmers of Arlington, knowing a great deal, just take it for granted that every óne else knows as much as they do; and therefore they have not considered it necessary to begin at the beginning, and tell the process of raising some of the principal crops. I should have been very much pleased to know their method of preparing the ground for the growth of squashes, melons, spinach, and other garden-crops. I hope, that, in the short time that remains this afternoon, we shall hear some of the farmers of Arlington, and that they will describe their method of preparing and caring for some of these principal crops.

Mr. Humphrey. I am interested, in a small way, in market-gardening. Although I am more than fifteen miles from Boston, yet we have scattered along our valleys a population that must be fed; and to these people I cater, in a small way. Being some distance from market, I raise some of the more substantial vegetables, — onions, cabbages, and potatoes; and I find that they are remunerative crops. I hail from that district, where, for some years past, the raising of tobacco has been almost universal, and where almost all the other crops have suffered from the partiality shown to that one crop. But circumstances have changed; and we have been obliged to turn our attention to some other branch of farming. Some have gone back to the old corn-fields and broom-corn, and fattening cattle; others, like myself, have gone into market-gardening; while a few continue to raise tobacco. I find, that,

in that locality, I can get as large a margin of profit for my labor and the manure expended, on onions, as on any other crop. I do not raise them very extensively. I had only half an acre this year, on which I raised between three and four hundred bushels of good onions. I do not manure as heavily as some men in the eastern part of the State, where they can go to the cities and get manure; but I have used fertilizers. Last year, upon a quarter of an acre of onions I raised about a hundred and twenty bushels, with nothing but the Stockbridge Fertilizer. I put on two formulas, and I had a hundred and twenty bushels of nice onions, without any manure. I find, in raising cabbages, that I get a larger percentage of large, sound heads, where I use the Stockbridge Fertilizer, than from any other manure. I have used the Stockbridge Fertilizer altogether for the past two or three years universally, for all the crops I have raised; and in every case I have found that it comes nearer to what is advertised than any other fertilizer I have bought. As I say, I find, in raising cabbages, that there is a larger per cent of large, sound cabbages where I use the fertilizer with manure than any other fertilizer. I find cabbage, in my section of the country, a very exhausting crop to the soil. It is almost impossible for me, without extremely heavy manuring, to raise a fair crop of any thing after a crop of cabbage. It takes two or three years for the land to recruit, so that I can raise any crop as I could before I planted the cabbage. My soil is Connecticut-river bottom-land, flowed over occasionally, and is good soil, where I can cut enormous crops of grass for a series of years. I find that potatoes are a very paying crop. I raise them at the rate of two hundred and eighty bushels to the acre, and apply at the rate of two formulas of the Stockbridge Fertilizer to the acre, costing twenty dollars; and, at the price of potatoes in our vicinity, it is a very paying crop indeed. I think that potato-culture throughout Massachusetts ought to be encouraged more than it is. It is a staple vegetable, more largely consumed by our population than any other one vegetable, and necessarily we must produce larger crops. The great bulk of our potatoes come from elsewhere; and, even at fifty cents a bushel, in my section we can hardly raise any crop which pays better.

A question has been asked in regard to the Colorado beetle.

I attempted to carry out President Chadbourne's plan of picking the bugs; and I found it was not so much work as some people thought it was, although it was considerable work. I picked them; and although I did not keep the vines entirely clear, yet I kept them in such condition, that I got a bountiful crop.

Adjourned to half-past seven o'clock.

Evening Session.

The meeting was called to order at half-past seven o'clock, by Capt. Moore, who introduced President Chadbourne of Williams College.

ORIGIN AND DEVELOPMENT OF CULTIVATED PLANTS.

BY HON. P. A. CHADBOURNE.

Mr. Chairman, Ladies and Gentlemen,— I appear before you to perform a very unpleasant service; and that is, to take the place of the lecturer who has been advertised to speak here to-night,— one who would have come prepared to give you instruction in regard to a far-off land; in regard to a people in whom we take a very great interest. I am sorry to say that President Clark is entirely unable to be here to-night. It is unpleasant at any time to take the place of another lecturer, but especially such a lecturer as he is, having such a subject as he proposed to present. Besides, I feel in regard to this Board, having been called upon year after year for so long a time, very much like the old minister down in Maine, who came to a parish, and preached about six months, and then told the people that he should have to leave. "Why so?"—"Why," said he, "I have told you all the stories I know, and, if I stay any longer, I shall have to tell the same stories over again." But Mr. Flint telegraphed me, on hearing of President Clark's illness, to fill his place, and I am here in obedience to that summons.

It is understood, I believe, that I shall take some sort of outside course whenever I appear as the lecturer of the Board; and I am going to commence far off, and work up to

the subject of market-gardening. Here this afternoon you listened with great interest to all that was said, and you found that market-gardeners do not agree among themselves: they are like scientific men; we do not agree. There appeared a very great necessity for more accurate observation; a necessity that our farmers' boys, if they are to make farming pay, should understand. They should also have that in themselves which will make farming pay in something besides dollars and cents. I was particularly interested in what one gentleman said this afternoon; that, when it came Thanksgiving Day, he had a crop around him that was pretty profitable to him, if it was not to anybody else. There is more than one way to make farming pay. If we only try to make any business pay in dollars and cents, we shall be poor all our lives, and go down to the grave in absolute poverty, though our heirs should inherit untold riches when we die.

My course to-night may seem a little on the outside; but, before we get through, we shall come around to this corn which I have here on the sofa, which I have been experimenting upon this year. Now, I propose to ask a question, in order to illustrate this one point which I have brought up, in regard to the necessity of more accurate observation, and to convince you, I think, that we are very deficient in this matter. I suppose there is not a fruit on the face of the earth that this audience is better acquainted with than with the apple, and I propose to ask you a single question in regard to that fruit. There are on the blackboard the outlines of two apples. If we cut down through these apples, we find seeds in them. There is not one in this audience who has not cut an apple open hundreds of times. Many of you have cut them open to-day, I presume. Now, an apple-seed has a sharp point, and I want this audience to tell me where I shall put that sharp point in the apple. Shall I put it towards the stem, or shall I put it towards the calyx? [A voice: "Towards the stem."] Those that think it should be put towards the stem, raise their hands. [A few hands were raised.] Those that think it should be put towards the calyx, raise their hands. [Quite a number raise their hands.] Those who do not know, raise their hands. [A large majority of the audience responded.] Why, there are votes enough to carry a man into Congress,

of men in this audience who do not know which way the sharp point of the seed is placed in the apple, — a fruit that you have all around you, and cut open and eat every day! What is the use of standing here, and talking about observing, when this is the result? Some six or eight voted to put it towards the stem, and twice as many to put it towards the calyx; that is to say, you are wrong two to one, besides a great many who do not know any thing about it. I cannot give any better illustration of the want of observation, or, rather, the want of observing in such a manner that you can carry your knowledge with you always; and, unless you do this, you will be constantly making observations and making experiments, and leaving out some important thing which seems to you of no importance whatever. Now, if you cut an apple open, you will find that sharp point to be towards the stem. But just bear this in mind whenever you are carrying on any of these discussions; and let no man get up here and say, "I have observed this, and observed that," and go on, and show by every thing he says, almost, hour after hour, that he has failed to observe those things that are absolutely essential to the accuracy of his observation, or the perfection of his experiment.

I have been trying some experiments this year in regard to fertilization, which would carry me directly, if I should begin with those, to the subject which Professor Goodale, one of my old pupils, will present to-morrow evening in a very much better way than I can do it. I propose to commence very far back, and to pass on very rapidly indeed. I am glad to have these flowers and plants here. Just look at these plants, and see what treasures we have. In the first place, here are ferns. If we turn over the fronds, we find the fruit in minute dots. Put them under the microscope, and we should find the ultimate fruit, or spore, to be simply a little cell. Here we find a tree loaded with oranges, — large, beautiful, most delicious fruit. We find our table covered with beautiful flowers. Whence came all these? What was the origin of all these? I do not propose to-night to spend your time in discussing Darwin's theory, or any other theories; but I wish to call your attention to the beginning of plant-life, and then to bring you rapidly along through the changes that we know have taken place as we come up to the plants

that we now use, and then to show what their nature is that adapts them so perfectly to our wants that we go on from day to day, and year to year, discussing these problems in regard to the perfection of plant-life. The things I am now going to state to you are those that I believe are accepted by all persons of science, no matter what theories they may hold in regard to the progress of life on the globe.

We all know that there was a time when there was no plant upon this earth. Here was a globe of melted matter, if you please, and by and by a globe covered with solid rock, with no vestige of plant-life upon it. If there is any thing we know in science, we know that; and yet we are here to-night, surrounded by all these beautiful forms that are spread over the earth from zone to zone; and not only on the earth, but abounding in the waters; not only in the torrid and temperate zones, but in the frigid. Very few persons have any idea of the amount of vegetation in the northern zone. I confess that I was perfectly astounded, when going up among the icebergs of Greenland and Iceland, at the abundance and variety of the vegetation there, — not on the land, but in the water. As you sail over those beautiful bays of Greenland, and look down into the water, it seems as though you were passing over a forest. It looks as though the vegetation of the land had gone down beneath the waters. You find that vegetation grows there with a rapidity perfectly marvellous. Our boat, that simply rested a single week in the harbor of Godhaab in ice-cold water, was found to be covered with vegetation, and the bottom of our vessel was abundantly covered. There is vegetation, even in that northern zone, in the water, so adapted to the place in which it is found, that it grows in abundance. How has this all been brought about? We know that the earth was first covered with a very low form of plant-life. We have just as low forms of plant-life now. The lowest form is the single cell. We can find plants in our pools in the spring of the year, which begin life as a cell, and never go beyond the cell, and propagate themselves by division of the original cell, or by forming other cells within the original cell. Then come the *algæ*, the seaweeds, and similar kinds of vegetation. There was a time, in the history of our globe, when those constituted all its vegetation. That was the lower

form. Then, coming up still farther, we begin to find these beautiful ferns and other higher cryptogamous plants in abundance, at the time of the coal-period, when they covered the earth, and gave us, as the result of their deposition, those beds of coal upon which our present civilization depends. They were just as much fitted for us, just as much, in my judgment, prepared for us, as were the fruits that we now gather and garner for our use. Passing from the lower forms of plant-life, the pine tribe, that is, the cone-bearing trees, begin to appear, and, along with them, what we call the monocotyledonous plants; that is, those allied to our grasses. Then, coming up still farther, we find plants that represent those we have before us here. As we come to the time when man was introduced on the globe, we begin to find fruits and flowers, or plants from which our fruits and flowers have sprung.

This is the line of descent in general. I say nothing about theories now. The facts we know. By breaking open the rocks of the earth, we know that first we have those in which there is no evidence of plant-life; we then have rocks in which there are very low forms, rising higher and higher, until we come up to the last strata in time, where we find evidence of the introduction of man; and then these higher plants appear on the globe.

Now, there are three theories which it is worth while for me to state very briefly in regard to the origin of these things. Let me state them without entering into any controversy, and without attempting to-night to substantiate either of them. There seem to me to be three prevailing theories in the world, two of which are so mixed up, that people are constantly confused in regard to them, just as they are in regard to what they observe, as we have seen here to-night. One is called the Darwinian theory. He starts with the germs; but he has never yet told us where those germs came from. He says those germs had two characteristics, which all germs which we have observed now have, — the two characteristics which enable us to have a Board of Agriculture. The foundation of this Board of Agriculture was laid far back in the nature of those germs that first appeared, no matter what our theory may be in regard to how they were developed. What are those two characteristics, — for they

seem to be exactly opposed to each other? All these germs, first of all, have a tendency to reproduce their kind: so that, when we have a germ, we know that from that we shall get something like it: that is the first characteristic. The second is that they have a tendency to vary; that is, while they reproduce their kind, they have a tendency to produce something a little different from themselves; and in this fact — that those living germs have the power to reproduce their kind, going on, and giving us the same kind of form, and at the same time varying so as to give different forms — we have the foundation of our science and encouragement in all our labor in agriculture. Given these two things, — permanency, so that we may be sure, when we put the seed into the soil, we shall have the same thing in kind spring up that we put there; and also variation, so as to give us a little different form, — we can take the seeds of that plant, and the plants produced by its seeds will be likely to vary in the same direction; and so, going on farther and farther, we shall secure different varieties. Now, Darwin says, that taking these germs, with these two characteristics, — first, of reproducing their kind, and, second, of variation, — and giving them time enough, Nature has worked out all these results which we see; that all these different forms have come from those two characteristics of plants by the operation of a principle which he calls "natural selection." I may have time, before I get through this lecture, to illustrate the action of "natural selection."

Another theory which is constantly confounded with this is the evolution theory proper, — the theory held by such men as Mivart. It is that all these forms started from germs having just exactly the two characteristics which Darwin ascribes to them, but that, so far from developing in all possible directions, they have in their nature, from the beginning, a principle that determines just how they shall develop, a power which carries them along a specific line; as Professor Gray, who claims to be a Darwinian, says that plants vary, but, in his judgment, vary on beneficial lines. You see, the moment a man says that, he acknowledges at once that there was some Being who made the germs, that had the notion of doing good to man, and so caused them to vary along beneficial lines. Darwin would not accept any theory of that kind; but an evolutionist may accept it, and say

that in each germ was the power to reproduce its kind, and, as the globe went on progressing, it had the power to throw off, at just the right time, the kinds of plants that ought to be found on the earth: and therefore from these germs we have, by a regular law, all the different forms that now exist, just as from a single seed you have growing up the wood, the leaf, the flower, and the fruit, all parts appearing just at their proper time. Who would suppose, in examining a germ, and tracing it back to the original cell, and the cell of pollen that comes in, — who would suppose, I say, from the development of that cell, or from that germ if you please, you would have all these parts, — the roots striking down into the earth, the branches stretching out into the air, with leaf and flower and fruit? Nobody would expect such a result, unless he had seen it. We should believe that such a phenomenon as that was something that came under law, and that there was some power which determined when the flower should appear, and put all these parts together. Now, according to the true evolution theory, all these germs had the same relation to all plants that a seed has to a tree, and throw off all these forms at the proper time. When they are thrown off, of course they must be distributed; and here comes in a whole line of argument and illustration in regard to distribution, and in regard to the operation of "natural selection" again.

Now, the third theory. And please to understand that I do not give these three as being the three that would be given by everybody; but they are, in my judgment, the three that include every theory that has been broached. The third theory is, that every one of these separate forms was a distinct act of creation. This was what Professor Agassiz always held. I have been indignant at some of the articles I have seen in certain publications in regard to him since his death. I worked with Professor Agassiz for a long time, and I talked all these matters over with him. He has told me what he believed over and over again, and, if ever any man in the world believed any thing, Professor Agassiz believed that every single species was a distinct creation.

Now, those three theories account, in their way, for the introduction of plant-life on the globe, and the production of the present species as we find them. But, when we trace all

these flowers and fruits back historically, we lose sight of them, as we do of many things in our own history. We cannot trace them all back to their ancestors. A very large number of our valuable fruits and grains, it is impossible for us to trace back. The history of some of them is known. Those that were discovered in this country we can trace back to their discovery here. But we cannot trace back Indian corn to the wild kind. It has been said that Indian corn has been found in some places on this continent wild; but I have never found those statements substantiated. It was found in this country, and found among the Indians; and that is all we know. While we cannot tell the origin of all our cultivated plants, we can trace them back far enough to be able to say that the plants which we to-day cultivate, the plants which you come here to consider, the growth of which you have been discussing this afternoon, — we can trace them back far enough to say that their early forms were hardly fit for men to eat: they existed in a very poor, mean, crude condition. We are able to say this, and that many of the things that to-night delight us by their beauty, and delight us by their delicious flavor, and that are for the comfort, support, and enjoyment of the human race, are what they are in consequence of the action of man within the historic period. Looking around here, I see some men in whose hands these plants have shown their plasticity, and their adaptation to human wants. Just think of it. Is it true that our friend Mr. Moore, and our other friends around us, are able to bring out these splendid specimens of improved plants, — improved cauliflowers, improved pears, improved grapes, improved strawberries, and all the rest, — that they are able to do this in consequence of a characteristic which was lodged in the germ millions of years ago? Down in the deep rocks of the earth are found remains of plants bearing the characteristics of the lower seaweeds; but yet they undoubtedly had in them these two elements, — that of perpetuating their kind, and at the same time that of varying so as to give a different form. Now, it is relying upon these two characteristics of living species, that you do all your work here.

And now I wish to bring out a new law of plant-development, which, although it seems simple enough when stated

has caused me a good deal of study. When you look over plants, you will find they divide themselves naturally, not botanically, into two great groups, according to their lines of development. If you arrange all your plants botanically, you will find that those two groups that I am about to mention cut through the great botanical divisions. Plants can be divided into two great groups, one of which always develops in the line of utility (I am using "utility" in its common sense), and the other always develops in the line of beauty. Now, having made that statement, I wish to call your attention to certain plants well known. I will take, for my first illustration, the apple. You see that I come round to the apple, with which I began. Take an apple and a rose. All of you have observed enough to know that the apple-blossom is a little rose in structure, that the apple belongs to the rose family. We do not know how long the rose and apple have been cultivated; but we have evidence of the cultivation of both of them farther back than history goes. In those old villages covered by water in Switzerland, we find evidence of the existence of the apple and the rose also. Going back just as far as we can go, and tracing them up to the present time, we know that apples and roses have been cultivated in almost all parts of the world. You know that to-day there are thousands of varieties of both, and you know that you can produce other thousands. I would like to know if any man ever heard of an apple-tree developing in the line of beauty; that is, developing its flowers so that they became large and beautiful roses. It is barely possible; but the natural line of the apple is fruit. I would like to know if any man has ever seen a rose that developed large, delicious fruit. Is not all its development in the line of beauty? When you take a flower to cultivate, do you not expect that the plant, when it varies at all, will vary in the line of beauty, that it will give you a larger and more beautiful flower? You never expect that a large fruit will be developed there. In the wild rose you will see the fruit corresponds with the apple: it is not a large one, to be sure; but why does it happen that the rose and the apple, which are botanically alike, are developed in such entirely different directions? If you plant ten thousand apple-seeds, you do not expect to raise a single tree that will produce simply

large flowers, sacrificing its fruit; but you expect that its line of improvement will be in the direction of large and delicious pulp. If improved flowers are produced, it is a very rare exception.

Let us take another illustration, nearer still; take the potato and tomato. You know very well that they are botanic brothers. Even the potato-bugs know this, because they will eat tomato-vines when they are driven to it. What is the line of development in each? You know the potato has potato-balls on the top of the vines; and they correspond exactly to tomatoes in structure: they are the same thing botanically as the tomato. The potato has been carried over a great portion of the globe. See the number of varieties that have been produced in different parts of the world. If you take ten thousand seeds of the potato, and plant them, what do you expect to produce? Do you expect to produce plants that will bear large, edible fruit on the top? No. You expect that the plant will vary in the line of its tubers always. We have to-day hundreds of varieties of the potato, and there is no end to the number of kinds that you can produce; but the plant always develops in the same line. How is it with the tomato? If you plant its seeds, you expect that the fruit on the top of the plant will vary. Certainly. Nobody ever heard of a tomato varying, except in the line of that fruit on the top: that fruit is its utility. You have the potato varying in the line of its underground stems or tubers: that is its utility. I might go on illustrating this principle, and give example after example of plants that are close together botanically, developing in different lines. Those who first cultivated these plants did not know what the leading idea of the plant was. They saw this beautiful flower, and they said, "Let us save it," because all men, even savages, have an appreciation of the beautiful; and they began to cultivate it, and it began to develop in its own line. Then the fruit-bearing plant attracted attention, and secured cultivation for its utility; and it developed in its line. And the result is what we see in beautiful flowers and delicious fruits.

Now, how far can this be carried? This variation is first for the benefit of the plant. It is for the purpose of adapting the plant to the earth: that seems to be the primary purpose of this variation. I am speaking as though there

were a purpose in it. If you do not believe in such purpose, it is no matter; but I use such language because it is convenient, and I have been accustomed to it. I say this seems to be the first object, to preserve the species, and adapt it to all parts of the earth. Let us see, then, in regard to the extent to which this principle can be carried. You will find that this principle of variation can be carried so far as to utterly defeat its end, if you suppose that the distribution and preservation of the plant is its object. And this is a point to which I wish to direct your special attention, to see if we can reach a principle in it. I hold in my hand a rose (and I am glad they brought in such a rose as this): it is called a double rose; but in this rose I can see stamens and pistils. That rose would probably reproduce its kind from seed, because it has the organs which are essential for reproduction. There are roses in which you shall not find a single stamen or pistil. They are all unrolled, all developed (if I may use that term "developed" in this connection), — they are all unrolled, and made into these flower-leaves. And you will find other plants in the same condition. All peonies are not double; but some are so double that they have no stamens or pistils, and never produce any seeds. We call the snowball double; but it has quite different characteristics from the rose. In its wild state it has a circle of flowers on the outside which never produce fruit; but it has flowers in the centre which produce fruit. By cultivation they lose their stamens and pistils, and they become large, and give us beautiful white bunches of flowers; but they cannot produce fruit. What does this show? It shows that this principle of variation, which begins far back in the life of the plant, — begins for the benefit of the species, — finally ends in what would seem to be the destructicn of the species, because, when you carry this variation so far as to destroy the stamens and pistils, just that moment you have destroyed the plant, so far as the seed is concerned: you have stopped all that machinery for the continuance of the species through the seed.

Let us look at that a moment, and see exactly what it leads to. What has been the result of this wiping out of the seed-producing power here? The result has been increased beauty. You have gone on developing this flower in the line of beauty, its utility gradually giving way, until

by and by it all disappears, and the plant appears before you simply as an object of beauty, having no power to reproduce its kind. Having lost this power, it is no benefit to its species. It is a draft upon this plant, and therefore it is an injury to the individual. So far as the plant-life is concerned, the machinery is all out of order, because here we have material taken out of the wood and leaf, and put into this form, — of no sort of use to the plant itself, of no sort of use to the species, because it cannot produce seed.

But did you ever see any plant whose flower could be made perfectly double, that could not be propagated in other ways than by seed, — by root, by stem, by bud, or graft? You have annual plants that you call double; but, when you examine them, you will find that they are not perfectly double. Take those plants you can carry along on the line of beauty until you have completely wiped out the stamens and pistils, and you may be sure, that, when you have done that, you have gone as far as you can go; and, if you want to propagate such plants, it must be by some of the methods I have mentioned, — by budding, layering, grafting, or some process other than the seed.

Take an apple, for instance. What is the use of its pulp? Every one says at once, "The soft part of the apple is to cover the seed." Certainly. But, then, just look at our apple-trees, and see how large the delicious pulp is, compared with what is needed to protect the seed. And do you not know, also, that, when apples and pears become so large and delicious, their seeds are not as large or fully developed, and very likely there may be less of them? And so of the grape. How far can this increase of pulp be carried? You know that some oranges have no seeds. I presume we should find plenty of seeds in these oranges. But some of the nicest oranges from Fayal, and other places, have not a seed in them. The process in them has been carried so far, that you have simply a great globe of delicious pulp, with hardly a vestige of seed. In some grapes this process has been carried so far, that you have a mass of delicious fruit, and not a seed in it. You have carried this process, in that sort, as far as you can carry it. Here, for instance, is a Fayal orange-tree, loaded with delicious fruit: what does it mean? It began by meaning good to its species, as well as to the animal kingdom.

Does it mean that now? Not at all. There is not a seed in the fruit: therefore the fruit cannot propagate its kind; and every single orange takes material out of the wood and leaf, that is, it takes the material that would have gone to build up the individual plant. Therefore this process is an injury to the individual, and it is no benefit to the species.

You see, then, that we can divide all these plants that we talk about here, day after day, into these two great classes. In many of them you can run the idea of beauty until the power of reproducing their kind is lost; or you can run the idea of utility until the same power is lost. But what do we gain in all this? In every case we gain that which man wants, that which is the prime object for him. We get the most beautiful flowers, and we get luscious fruit, without seed, and we have given to us means by which we can propagate both of them. Does not this look very much as though there was a purpose here, — a purpose that takes care of the plant while it is wild? But, the moment the plant passes into the hands of intelligent man, it manifests this law, by which it can be developed so that it cannot take care of itself; but, being take care of by man, it yields to him a hundred-fold what it could have yielded when it was left to take care of itself.

Now I come to a point which would lead me to a path which I do not propose to tread, which will be pursued by the lecturer to-morrow night. But I must come up to it. You will observe, that, so far, I have spoken of this variation as though, once begun, it was carried on in that particular line by that individual in which it appeared. Now there comes in another principle, which is a very important one, and which, I have no doubt, Professor Goodale will very fully develop to-morrow night; and that is this, — going down to the lowest forms of plants, we find something equivalent to sexual relation. Everybody understands there is sex in the higher plants. Linnæus, who was a great naturalist, showed his intuition, his keenness of insight, when he called the lower plants *cyptogamous:* that means the marriage-relation concealed. Although he could not point out, as we can, the sexual relation of these lower plants, he still believed in it, as is shown by his application of this word. Even in these low plants, where they are made up of a few cells, there is a

joining together from time to time of those cells. Why is it, that, for instance, in the flower of the apple-tree there should come up a central organ that holds the seeds, and then, when the time comes for those seeds to be fertilized, there should appear another organ, right by the side of it, in the same flower, bearing another kind of cell, — the pollen that must fertilize each seed before it can grow? It is a wonderful structure, as all of us are aware. But see what power this structure gives us. Here we have one plant developed in one line, and another in another. By taking some of those cells of pollen, and passing them to the pistil of the other plant, we are able to get the characteristics of the two plants in their young. What a wonderful power that gives us! We see among the higher animals that their association and parental relation is a source of great enjoyment, as, in the human family, it is the source of the greatest enjoyment, the highest and noblest we have. But why should sexual relation prevail among the plants? We have one characteristic in a plant, and we want another. We might go on and develop that indefinitely, and never get the one we want. But, just as soon as we find what we can do by taking the pollen of one plant and carrying it to another, we seek for a plant which has the characteristic we wish, to combine with the one we have. We fertilize one plant with the pollen of the other; and then, by careful selection and cultivation, we are likely to get just the qualities combined that we want.

In my judgment, there are very many agencies that have an influence upon the germs of our seeds when they are formed, that we do not now understand. The fact that seeds that look just alike, and were raised in the same place, give us much different results, is not always owing to the soil. I have no doubt that those germs are wonderfully sensitive, far beyond any thing we have ever dreamed of. There are many things in our experiments that lead me to suppose this. I believe, also, that the action of this pollen is very much more far-reaching than has generally been supposed.

I have here some specimens of corn which I have been experimenting upon this year; and the first specimens I show you will illustrate the point which I made in regard to the variation of plants. This is the small rice-corn. These ears which you see in my hand — three white and three red ones

— all grew this year from *white* kernels, which I shelled with my own hands from a white ear, and planted far off from any other corn, so that there should be none with which they might mix. Here is the result; and I expected that result, for this reason: My little boy found an ear of white corn, and he planted it in the field, and brought me the crop; and about half the ears were red, and half white. He assured me that he planted nothing but white. But I wanted to be sure: so I planted the kernels from one white ear and the kernels from one red ear. I examined all the kernels, and planted them myself; so that there should be no possibility of mistake. Now, I have these ears; and they vary in their structure, in the form of the kernels, and in their color. Do you not see, that, in that variation, you have the basis of producing any number of varieties? I doubt not any man could take that ear, and, by careful selection, in ten years he might have a very wide range of varieties of corn. From that one ear he can have large and small corn, red and white corn. You will observe that the mother-stalk of corn in this case has a peculiar power, because here is an ear that is all colored red. That color comes from the mother; that is, the stalk on which it grows. I think it was partly fertilized with white pollen, because these red and white ears were all picked from the same hill, growing side by side, and they ripened at the same time; and therefore it is fair to infer that those two ears were fertilized with pollen of exactly the same kind. You see that ear is red, and this is white, and has a very different form from the other. That shows, that, in this case, the mother, or the stalk upon which the ear grew, had a wonderful effect upon the color.

In some other instances which I have observed, I have found that the pollen has very much more power than the mother-corn. But I made another discovery, which was quite unexpected to me, and which was to me very interesting, and I think I shall make it so to you, as bearing practically upon our work in agriculture. All these red ears that I hold in my hand were raised from kernels that came from one ear. I selected an ear of red rice-corn, shelled it myself, examined the kernels, and planted them; and I raised all red corn. But what else did I find? I found certain ears entirely distinct from the others. There is one of them entirely dis-

tinct in the form of its kernels from the others; and, when I came to look at it, I found that nearly half of those kernels were shrivelled kernels; that is, they have the form of sweet-corn; and, if you pick one out and bite it, you will find that it is sweet-corn. You will say that that was fertilized by sweet-corn pollen. I tell you "No." These ears grew side by side, on the same hill. You would pick one of those ears (I have a great many of them), with part of the kernels large and full, and part of them shrivelled, and you would also pick from the same hill one of these ears of pure rice-corn. How do I account for that? This rice-corn, last year happened to grow in a part of my garden where the pollen of some sweet-corn was wafted over on to it; and that pollen of sweet-corn fertilized the seeds. But the mother-plant was so strong, that the pollen did not change the color, and did not change the form of the seeds: they remained exactly the same in form and color as those fertilized by their own pollen. But the next year, when I came to plant this corn, then it produced a form that showed that poison, if I may use the word "poison" in this connection; that is, showed the influence of the pollen that fertilized the kernel the year before. Now, here is an ear that was produced from that little rice-corn from the effect of a grain of pollen fertilizing one of those kernels the year before.

If our corn is so sensitive as this to every grain of pollen which falls upon it, and if we cannot tell, by looking at a kernel, by what sort of pollen it was fertilized, it seems to me that we have much to learn in regard to the production of seed-corn.

Here is an ear that was raised by my friend Hon. Asahel Foote (many of you know him), a very shrewd observer. He brought this to me as a new thing. But it is exactly the same thing that I had raised in my own garden; that is, it illustrates the same principle. He says, "Last year I had some corn growing near some sweet-corn, and I used some of it for seed-corn; and, behold, this year, although I planted, as I supposed, fine, plump corn, here I have ears with clusters of two, three, four, and five kernels of sweet-corn mixed in with the others. There was no sweet-corn, that I know of, within half a mile of it this year. These sweet kernels are the effect of the sweet-corn pollen that fertilized that corn last year."

There is a curious thing about this result. It shows that the effect will appear in one kernel, and not in another, just as you may see, in a family of children, one that will take after neither father nor mother, but will take after some ancestor far removed.

Now, we are very particular in regard to raising animals; but we do not take sufficient pains, it seems to me, to procure good seed for our crops. We have growing in all our fields a large amount of very inferior corn. We have some that produces very small ears. We have suckers coming up that may not produce any corn: they will put out tassels, and produce pollen; and some of our corn is fertilized by that pollen. We pick out the large ears that grow on large stalks, and we say, "We will take these for seed." That is doing well. But then those large and plump kernels may have been fertilized by very inferior stalks of corn; they may have been fertilized by some suckers even, that were unable to produce corn at all. Don't you suppose those kernels from ears that have grown on large stalks will have a tendency to produce those small, insignificant ears of corn, such as the stalks by which they are fertilized bore? I have no doubt of it. My judgment is, that in order to raise good, prolific seed-corn, it will be necessary for a man to plant the best seed he can procure; and before the corn tassels, before it produces pollen, to go along the rows, and cut out every mean, miserable stalk, so that every ear shall stand on a proper stalk (that is, have a proper mother), and shall be fertilized by pollen that has come from a strong, healthy, corn-producing stalk. If you will follow that up for years, I believe you will have corn of a size and quality that you cannot produce by the common method of selecting seed.

I told you I should come back, by variation, to the corn. That is the point from which I should have desired to start, had I not been informed that another man is to take that as his starting-point to-morrow night. Now, Mr. Flint wrote me, that, if I would come down and do this very ungracious work, I might stop just when I pleased. I have come to the point where I propose to stop this purely extemporaneous speech. But there is one thing more I want to present. Look at these flowers and fruits, and see what the vegetable kingdom is to-day; think of that power that has been lodged

in every plant out of all these useful plants to man,—the power of constant variation. Let it be remembered, that although we may have the most beautiful rose, or the most beautiful flower here, next year some one may produce, by virtue of this law of which I have spoken, a still more beautiful one; that although you may have the most delicious grapes, strawberries, oranges, peaches, pears, next year some one may have something better than those. That is, in all these plants that we have for beauty and for utility, there is lodged a principle that is exactly in keeping with the nature of that mind which God has given us. He has given us a mind that is capable of indefinite improvement. There is no end to the knowledge that man may gather and use; and in the nature of the plants with which this earth is clothed we have the same law. They may go on improving indefinitely. No man can place a limit to the improvement of fruits and flowers. There is no limit to the operation of that law placed in them, of indefinite improvement, corresponding exactly to the law which God has given our minds, that we may improve indefinitely. And it is here, in my judgment, that we have the best pay that we possibly can have, as we go on from day to day earning our living from the soil,—that we can use these grand laws which God has impressed upon the plants we cultivate, to increase their beauty for our delight, as well as their utility for our comfort and support. The enjoyment that comes from the contemplation of such laws and such results is a rich reward for a rational being.

Major PHINNEY of Barnstable. I feel that it is but due to Professor Chadbourne to say that he has always been prompt to respond to every call of the Board of Agriculture, as he has done in this emergency. I would move that a vote of thanks be tendered to him for his useful, interesting, and instructive lecture this evening.

This motion was carried unanimously, and the Board adjourned to Wednesday morning at half-past nine o'clock.

SECOND DAY.

The meeting was called to order at half-past nine o'clock by Capt. MOORE, who introduced as the chairman for the day Mr. AVERY P. SLADE of Somerset. The discussion opened with a paper on

THE BREEDING, TRAINING, AND MANAGEMENT OF HORSES.

BY JOHN E. RUSSELL OF LEICESTER.

The gentlemen who have assigned to me a subject so broad and comprehensive as the breeding, management, and training of horses, are well aware that its thorough treatment would require volumes: they must therefore intend, in the necessary limits of such a paper, that I touch it with a light hand, and merely suggest points for discussion. It is generally conceded that horse-breeding in New England, as a business, is not successful; that it is not the legitimate occupation of the farmer, but only the pleasurable pursuit of those who can afford to breed without regard to profit. We have the testimony of breeders of all classes, who agree upon this point. I may add to this conclusion, that New-England horse-breeding, for twenty years past, has not only been without profit, but it has been discreditable, inasmuch as the great proportion of horses produced have been of poor quality, neither fit for genteel service, nor for the labors of the farm. Many reasons are assigned for this failure. Long arguments are made to show that we neglect certain mysterious laws of selection, that, if understood, would lead us to results as positive as are obtained by those who successfully breed sheep, hogs, or horned cattle.

People ignorant of their business, or careless in it, commonly fail; but it cannot be said that our horse-breeding has been attempted merely by the heedless and the ignorant. It has been attempted by men successful in other pursuits; it has enlisted great enthusiasm; it has commanded large capital; it has had intelligent exposition; and it has been the theme of constant discussion. Men of high social position and wide personal influence have engaged in it, and been cordially supported in their sales; but the summing up is financial loss, disappointment, and disgust.

When one enters upon the production of any article for sale, he should carefully consider the market, and endeavor to make his production conform to the demand, in price and quality.

The farmer who breeds for sale must rear what the public want, and be able to make a profit at the price his animals will command, or he labors in vain. In our horse-breeding, instead of producing elegant horses for the rich man's carriage, or powerful workers for the cart or plough, or quick-maturing, active helpers in the busy traffic of our city life, — something that can be done with certainty and profit, — the chief object of the New-England breeder has been to produce a horse that can be trained to a track-record in his second-best gait. The occasional vast prizes of the trotting world have so dazzled us, that we have overlooked sober prosaic gains; and each man has sought to breed a Lady Thorne or Dexter. The man who endeavors to act intelligently in breeding trotters, and begins by examining the ground to see how he shall best accomplish his purpose, is at once met with the never-ending controversy as to what is the origin of the trotting-power. One powerful party, strong in vested interests, contends that it is proprietary in the family of horses descended from Messenger, — a thoroughbred English horse imported at the close of the last century, whose precious blood, though infinitesimally diluted, still asserts itself, and grows stronger the less there is of it.

The Morgans — whose original blood was pure and strong enough to found the best family of horses for general use ever known in this country, but now passed by because quenched in floods of cold puddle — have had enthusiastic volumes written in their praise.

One faction asserts that any family of horses trotted for a few generations is liable to produce trotters, because instinct is the sum of acquired habits; and trotting, in their view, is a mental, and not a physical phenomenon.

Collateral branches of the various equine families, that are reckoned as the natural heirs of the family gifts, are eagerly sought as having the powers of transmission.

Accidental horses of all sorts of lineage, both high and low, constantly appear to upset these fine-drawn theories. But the larger breeders are usually governed by their precliv-

ity for some especial family; while the occasional breeder, bewildered by the jargon of disputing horsemen, commonly goes it blind, taking his chance for a Goldsmith Maid or a Rarus by breeding his usually worn-out, unsound mare to a horse of a track-record, or often to a horse whose boasted excellence is in his relation to a horse that had such a record.

Stock horses that have, among hundreds of unknown or forgotten failures, registered some accidental trotters, have had no lack of patronage, and, in some well-known cases, have commanded enormous fees for their services; greater, in the aggregate amount, than the whole value of their progeny.

But the trotting-business is a complicated one. It does not end with the growth of the foal to common maturity: that is but the beginning of sorrow and responsibility. This trotting-instinct, unlike other horse qualities, is latent. The horse that can trot fast don't know it: he has to be developed by a peculiar course of instruction. He is like a deaf man, who is also mute because he has no comprehension of speech; and his unused faculties have to be awakened in the brain, and the organs practised, until he learns lip-reading and speech. So the colt has to be "developed," — "handled for speed." Then begins the real expense of his rearing. One season of a young horse in the hands of a "professional," with the cost of sulkies, blankets, boots, toe-wrights, constant changes of shoeing, &c., will take the cost of a trotter far beyond any thing that he will realize as a mere horse.

It is the rule of these ventures, that the colt is a failure, and that, tried too young, he is over-worked in training, and comes back to his owner with puffed legs, stiffened joints, contracted feet, and, it may be, with incorrigible vices. But if he prove the exception to the rule, and develop speed and stanchness, it is then incumbent upon his owner to take him to the track, enter him skilfully where the most can be made of him by getting or avoiding record; and the profit must be had from the games of the track, or by selling the horse for a price that indicates at once that he is to be used for gambling-purposes. It is calculated by observing horsemen, that when the best sires and dam are selected, and the produce bred with the greatest care, the chance of producing a record trotter is about one in a hundred; but, when

the business is attempted in the hap-hazard way, the chance of success is infinitesimal.

But if these failures to make trotters could be profitably utilized in any other direction, if the horse which finds the miles too long to win somebody's money for his owner could be sold for a high price for other use, there would still be hope for the breeder. But it happens that these families that are the residuary legatees of the trotting-power have little else to recommend them, lacking style and size for the carriage, weight and power for draught, and falling far short of the physical and mental standard demanded for the saddle.

It is especially unfortunate that several of the favored progenitors of the trotting faculty have been the veriest brutes in race and disposition, soft in bottom, unsound, and leaving behind them a heritage of defects that taints their whole line of descent.

Among the disputes, false pedigrees, ignorance, and hap-hazard of trotter-breeding, the chances and the results are about the same as a cynical Frenchman said they were, when a man sought to get a good wife in Parisian society. He said it was like grabbing for an eel hidden in a barrel of snakes.

It thus appears that our horse-breeding is a failure, because we have pursued a branch of the business that is involved in such doubt and difficulty, that it compares with legitimate pursuits as the investment of money in lotteries compares with regular industry. We have done it at an expense that the most favorable outcome could not reimburse, and we have been trying to produce that which has but a limited market, and that depends upon sport or fashion.

At this moment, while the country is full of trotters that lack the disposition, or the wind, or the limb, or all of these, to trot, it is well known that fine horses for carriage-use were never so scarce as they are now. The observer at our watering-places and in the city parks will notice that there is a return to English fashions in pleasure-driving; that slower horses of fine action, fit to wear heavy harness, and draw large carriages, are in vogue; that the coaching-clubs, dog-carts, tandems, and T-carts, require a different style of horse from the light wagon; and the long unused manly pleasure of the saddle demands the shoulder, the pliant neck, and the elastic pastern, of the blood-horse.

These are the horses wanted by all the luxurious and wealthy of the world. The finer and more beautiful the animal, the surer his market. We want a proud, fine-actioned horse, — a lean head, with thin lips, open nostril, full, kindly, lustrous eye, a broad forehead, and quick, playful ear; the crest not too high; the neck light, well set, and arching; the throttle large; the skin thin, and the fine hair blooming with health; the limbs powerful and perfect; the hoof round and hard, — the type of horse whose back has been the throne of conquerors, whose neck is clothed with thunder, and the glory of whose nostrils is terrible. Granted that this is the ideal horse, the horse of story and of song, yet it is easier to produce him in his highest possible perfection than it is to get the ideal of the trotting-track.

An accidental, elegant carriage-horse may be occasionally found in any of our families of horses. Morgans, Hambletonians, Clays, Mambrinos, produce them more frequently than they produce low record trotters; but all these families lack the combination of size, style, courage, and bottom, that are wanted in the horse for which there is a steady, unfailing demand.

It has been urged by writers who have considered this subject before me, that, in order to produce carriage-horses or park-horses of proper quality, we should use the exceptionally fine ones of the families we have, and find our result in their produce; but experienced breeders are well aware that accidentally fine animals of races of mongrel blood do not reproduce their own accidental qualities, but commonly throw back to their inferior ancestry. If this is allowed, we must look outside of what we have, if we intend to breed horses for profit. At this point of our investigation we are not compelled to grope in the dark: we are upon ground that has been carefully explored, and we can avail ourselves of the experience of the world.

The poet says, —

> "From fairest creatures we desire increase,
>   That thereby beauty's rose might never die,
> But, as the riper should by time decease,
>   His tender heir might bear his memory."

We know that beauty of form, fineness of bone, good stat-

ure, and other high qualities, if inherent in families, may be continued by careful selection.

The question then arises, What available race is there, that, bred through long generations, is so established, that it is unfailing in its power of reproducing its qualities? We know that the horse of the East is the type, and that his is the parent race; and we know that the Eastern horse, Arab, Barb, or Turk, was the founder of the present race of English thoroughbreds; and it is the experience of the world, that the Anglo-Arab, nourished, trained, and tested for two centuries by the best horsemen in the world, is the unfailing fountain to which they must recur.

On the Continent of Europe this question is so settled, that there is not an argument to the contrary. The government breeding studs of every nation are supplied with sires from "the tight little island." Every important sale held in England has competitors from the Continent; and, when the horse Blair Athol was brought to the hammer, an English breeding company was compelled to pay fifteen thousand guineas to retain him in England.

So great has been the drain, that the English are alarmed; and the warning cry is raised, that they are being depleted of their supply.

In every city of the Continent, even to the south of Spain, the traveller sees in each magnificent equipage the blood that has been so long the glory and pride of England. We are fortunate in having a long-established branch of that family in this country, in some respects superior to their English congeners. The soil and climate of Kentucky, that State, as my old friend Dr. Weldon says, "of short-horned cattle and long-horned whiskey," has proved their kindly nurse, and put foward horses that even dare to cross the water, and challenge English sportsmen on their own turf.

And now I come to the assertion, founded on the facts of general experience, that, if we are to breed for profit and credit, we must come forward with the rest of the world and employ the services of selected thoroughbreds. I say "selected," because I am well aware that there is a vast range of choice in thoroughbreds. I have sometimes been almost persuaded that half or three-quarters bred horses from strong stock would best answer the purpose. Justin

Morgan, Abdallah, American Star, and Mambrino Chief, are examples of this grade; though, in such cases, there should be blood on the side of the dams, or re-enforcement of blood in the next generation. In selecting a thoroughbred, I would choose no weedy horse, because he had run fast miles, or lowered the record at short distances. He should have the beauty of his race, and show his kingly lineage in his bearing and expression. He should be fifteen and three-fourths or sixteen hands high, without having long legs. He should have strong mental qualities; for a horse, like a man, cannot be merely an animal. He must be intelligent, brave, patient, and generous. He must have a pedigree in which every ancestor is known to have been of approved excellence, and with record showing that they have been willing to die to carry their owners' colors to the front, and that, in the test of the four-mile race, they have swerved not from the cold steel, nor the sharp switch of whalebone, but run straight and true, as old man Harper used to say, from "eend to eend."

Let the men who are so swift to disparage those they contemptuously mention as "runners" not forget that the finest race of horses ever known in New England came from the thorough blood that flowed in the veins of both sire and dam of Justin Morgan; that both Hambletonian and Mambrino Chief, representatives of the two great rival families of trotters, are but four removes from powerful race-horses. And while both of these sires have made abundant failures with mares of cold blood, they have made great successes with mares strong in racing blood; Hambletonian sharing his fame as a sire almost entirely with the daughters of American Star. And Mambrino Chief has had a wide range of fine-bred mares; Lady Thorne, unquestionably the best track-horse of her day, the only trotter Goldsmith Maid ever met from whom she could never win a heat, being by Mambrino Chief out of a dam almost quite thoroughbred.

And now it is full time for me to come to the question of what sort of mares shall we use. When I look at our New-England stock, it is easier for me to say what should not be used. It is generally claimed, by those who write and talk the most about horse-breeding, that foals follow the sire, and that the best mare is the one that impresses her offspring the least with her own individuality. There is much argument

cited from the Arabs, and other vague experience, to show the truth of this opinion. I entirely dissent from this view. This is a theory contradicted by all true observation and experience. It is not the theory of the Arabs, either: it is part of that vast amount of theorizing done in the all-pervading stallion interest. A ready belief has been accorded to it, because in our way of breeding, the male is the selected parent, and usually of a higher lineage than the dam; but, other things being equal, the mare is the parent whose impress is most to be seen in the foal. Why should not this be so? She is the equal of the male in every equine quality, and perhaps surpasses him in endurance. She concentrates herself upon one, and carries it in her body, nourished from her own heart's blood, sharing all her moods, and its temper varied by her experiences; while the sire may quicken the germ of two hundred foals in the same season, as careless of them all as the knight of old,

"Who loved, and who rode away."

The idea that the Arabs trace all excellence through the male line is derived entirely from the testimony of Abd-el-Kader, who wrote a notable letter to Gen. Daumas, in which he asserts that "the bones, tendons, nerves, and venous system proceed from the sire." He also concludes that the moral qualities have their origin in the sire, and that really the dam does little more than to give color and some resemblance to her own form. This is the opinion of a very eminent man, and a first-rate Arabian horseman; but perhaps, if we could bring together as many Arabs as there are American horsemen in this assembly, we would find as much difference of opinion as we are sure to find here.

Arabian testimony is based upon cloudy tradition or individual experience; but English and American thorough-breeding has a history and carefully-recorded observation which contradict the Arab chieftain, and bring proofs against him. In English and American thorough-breeding the dams are the equals of the sires in lineage, and often in performance; and it is so well settled that the dam must be of equal blood and quality with the sire, that no one would think of disputing it. The stud-book is rich with the names of illustrious mares that have bred winners to half a dozen different

horses, that have vastly increased the wealth of breeders, and proved the truth of the maxims of another Arab, the prophet Mahomet, who said, "Let mares be preferred: their bellies are a treasure, and their backs are the seat of honor."

Blood and quality can be obtained with so much greater rapidity by the male line, that highly-bred sires used with our best mares would soon raise the quality to the desired point. One of the follies of breeding is seen in the fact that mares are commonly allowed to breed, because they are, by age, hard work, or unsoundness, unfitted for other service. If a mare's nervous system has not been worn out, age is no reason why she should not rear foals. She must be sound in limb, of good constitution, and have room to carry her foal. Nervous, lathy, "tucked-up" mares, poor feeders, must not be used, no matter how fast they may trot. Size in a mare is not so important, if she have a good barrel, and if she is known to be of large-sized stock. Neither a large nor a small animal will perpetuate the likeness of himself or herself, unless descended from a family which is either the one or the other; for the fact that you get the characteristics of the breed, not of the immediate parent, always obtains. The better the mare is, and the better her lineage, the better will be her produce. And I will conclude this portion of my subject by saying, that if a man has not a thoroughly good, well-bred mare, and cannot obtain the services of a first-class, highly-bred sire, he had better let the matter alone.

MANAGEMENT OF HORSES.

Under this head I suppose I am to speak of the rearing and care of stock.

Having been a stallion-keeper, I wish to begin by some remarks on the management of stallions.

When a horse begins a stud-career, his owner should absolutely withdraw him from the worry and excitement of training. Horses kept for service of mares, and trained at the same time, will get nervous and excitable stock. But a worse error still is to put a horse into a condition of flesh, like a prize pig, in order to brag of how much he weighs, and to keep him, without exercise, in the close confinement of a box-stall, until he becomes a moody, morose, and often savage

brute. Many stallions become partially insane under the common treatment, and are a pest to their owners, dangerous to grooms, and beget vicious stock. A stallion should be kept in good health and moderate flesh. His box should be where he can have the constant company of other horses, or in sight of his mares. He should have a paddock to run in, or have plenty of cut grass during his season. He should be exercised in double harness, or under the saddle accompanied by other horses, as often as convenient. His exercise should be brisk and blood-stirring, with occasional sharp work so as to get a good sweat. Under such treatment, a stallion, unless he is naturally a vicious brute, will be as cheerful and pleasant to keep as any mare is.

Breeding-mares must be kept in good condition, — the best of pasture, oats and hay in winter, and warm quarters. Work will not hurt them. Some of the best foals have come from mares that worked moderately up to a week before foaling.

When a breeder, by the union of suitable parents, has produced a foal, it then rests with him to bring it to the full perfection of power. To do this, common sense, or what is sometimes called "horse-sense," is all that is required. A well-pastured or well-fed mare will provide all the nourishment the suckling requires. If it is a fall foal, it may be allowed to run with the dam until spring; but, if it is a spring foal, four or five months is the usual time. Foals are easily weaned, but must never be turned back to pasture. This is a critical time. The foal must be kept growing. He must therefore be kept in a convenient paddock, fed regularly with sweet hay and bruised oats, and continually handled all over from head to feet. Now is the time to train and break him. The lessons taught at this stage will never be forgotten, and he can be made perfectly docile and obedient. His feet must be carefully looked to, and not allowed to grow too long either at toe or heel. There is a common idea among farmer breeders that a colt should not be allowed grain; and nine out of ten men who show you a colt will boast, truly or falsely, that he has had no grain. I have listened to the remonstrances of my neighbors against my practice of training colts; they insisting that it was the occasion of various forms of bone disease. New England

abounds in wretched stock, that, in addition to the disadvantage of low mongrel breeding, has been starved at the growing time of life, raised on bare hill pastures where there was nothing to make a horse of, exposed to cold storms, scorching sun, torment of flies, and in winter compelled to live on meadow-hay, and shiver in the barnyard, an unkempt, long-haired, lousy scrub. A colt so reared, if he were descended from a royal line, would never make a horse. "Half a horse goes down his throat;" and the first two years is the time to make your horse in. The time then lost can never be regained. If you starve a well-grown, mature animal, he will be thin, weak, and unable to work; but you can return to generous diet, and put new flesh on his frame, and give the gloss of health to his hair. But a colt must be kept growing, or he loses his opportunity. Oats are the natural food of a horse; and a weanling may have from two to four quarts a day of bruised oats, and all the hay he can eat. The yearling may have more, if he exercises in a large yard or paddock.

At two years old a colt should be broken to harness, and have regular work. This will sound strangely to people who are accustomed to wait until a colt is five years old, before they halter break him; and I know there are many colts, that, for lack of breeding and keeping, are not mature enough to go to work at five. But I am talking now about colts that may be raised for profit; and such a colt must be fit to be broken to harness at two, certainly at three. There has been a great deal of dispute about this point in horse management. I have heard the arguments on both sides, English and American; and while I would not train a two-year-old for speed (except a thoroughbred), nor work him beyond his strength, I am fully satisfied that it is best to use him carefully for the better development of his muscles. The French breeders of the Percherons, a magnificent family of powerful horses, in use all over France, work them at a year old; and at eighteen months they are expected to earn their living at the plough and in the cart. There are no sounder horses in the world than those thus reared. In Mr. Murray's book on the Perfect Horse, there is an admirable chapter on "How to Train a Colt;" and, though I do not agree with many of Mr. Murray's opinions, that chapter and the chapter on horse-shoeing redeem all his errors.

Every breeder should be fond of association with animals: he should be a judge of form, health, and improvement, and he should understand how to handle them. There are no secrets in the horse-business that men of average intelligence in regard to animals cannot at once master. Quiet, patient ways, with low voice, and gentle but strong hand, will teach a colt all that he needs to know. There are men in every New-England neighborhood who can break colts safely to harness, and by persistent, careful practice, fit them to stand quietly, to stop at the given word, and to be way-wise on any roads. In my county of Worcester, there are communities where they take great pride in educating oxen; and I have seen, at Worcester and at Franklin County cattle-shows, steers trained to an incredible point of intelligence and docility. Boys that can train a steer to walk a chalk-line, and to go on his knees at the word of command, can do wonders with horses; for the horse enjoys the companionship of man, responds at once to kindness, and, next to the dog, has the quickest intelligence of any of our domestic animals. Horses for profit must be sold young, unless they earn their living every day. Leave speculation to jockeys and dealers; sell when you have a customer; sell whenever a reasonable profit is offered to you. The best time to sell is before the colt is foaled, to some one who is in love with the dam: the next best time is when the foal is weaned. To the common eye, all weanlings will make fine horses; and the price of a weanling generally pays more profit than the breeder ever has offered to him again. When your colt is past two, every hour that you delay to sell is "burning daylight." Early maturity is one of the great advantages in thorough blood; and no man can afford to breed from any family that is slow in maturing.

If horses are kept on the farm because they are thought to be improving, or useful in work, they are liable to accident, and they are usually injured in the feet from some of the diseases that are incident to shoeing. Our greatest folly in our management of horses is in submitting their feet to the clumsy handling of a stupid, ignorant, and often drunken mechanic, to have him shod. I will not here contend that horses should not be shod at all; because shoeing, though an invention of barbarians, is, when carefully used, an assist-

ance in utilizing the powers of the horse in his artificial life; but, in the common way of doing it, it is the most onerous tax imposed upon mankind. A horse condemned to wear heavy shoes to which heel and toe calkins are affixed begins to fail from that moment. At the age when he should be in the fullest enjoyment of his strength, he is called old. And few of our horses live out half their days, the great cause of their decline being from diseases of the feet; all of which are caused by ignorant shoeing. In the management of colts on a farm, they should not be shod until they come to rapid and long-continued labor on hard roads; and then the lightest possible application of iron should be made. The safest way is to let the hind-feet be bare, and to shoe the fore-feet with tips or crescents of iron that only cover the toe. It must be borne in mind that the frog is the natural level of the horse's foot, and the hoof must be trimmed, keeping that ever in view. I cannot close this paper without comment upon the manner in which horses are judged, and premiums awarded, at the annual fairs of our county associations. Regardless of breeding, form, comeliness, or temper, the only point considered is speed at the trot. And even when there is an award for the "family horse," so called, or the "roadster," the premium usually falls to the horse of these classes; that is, the faster trotter. I have seen a first premium awarded to a "stallion for general purposes" that was suffering from periodic ophthalmia, and that was stone blind within a year, and a first premium awarded to a three-year-old stallion which had, under his paraphernalia of trotting-boots, as much as two ring-bones; in both cases because they were skilfully driven by a professional horse-sharper, and made the fastest mile. A system under which such awards are made calls for thorough reform. In other departments of live stock, animals are judged by their points, and receive credit accordingly; and, if our agricultural societies wish to make their exhibitions occasions of profit and education, they should adopt a scale of points for judging horses of all ages, in which speed at the trot may be reckoned as one point, but in which size, symmetry, soundness, action, &c., should constitute others. Then if a ring-boned or spavined scrub, that has been "handled" and "developed" so that he can make a fast mile, beats a large, fine,

well-actioned, well-bred horse, let the scrub have the benefit of that point, but do not let him have a society's recommendation to breeders as the best horse "for the general purposes" of the year.

The CHAIRMAN. I think you will all acknowledge that the subject has been presented in a very masterly and happy manner; and it is now open for discussion.

Col. HUMPHREY of Concord, N.H. The subject presented before us for discussion is the horse. I indorse every word the gentleman says. I have had some experience in the matter, and I think I know something about the subjects on which he has spoken. I fully indorse his remarks upon the matter of racing-horses. If there is any curse in the world to young men and farmers, it is that of breeding a trotting-horse for the track. When I speak at our meetings upon the subject of the horse, I always take the ground that he takes. I consider it one of the most demoralizing things for a young farmer to get the idea into his head of breeding a horse for the track. But the gentleman has presented that subject so fully, that there is no occasion for my going into it. I will, however, state a few facts in regard to the amount of money that is spent in raising and training track-horses; and we all know that there is not one in a hundred of these horses that proves a success. I have taken a little pains to investigate the matter; and, if my memory serves me right, there were, last spring, two hundred and twenty-five horses at the training-stables in New England, not to mention the green horses and colts. Every gentleman who has a promising colt expects to get a horse that will trot in 2.20: 2.30 will not answer the purpose. When I was young, 2.40 was considered great speed. We all know that a very large number of the owners of these colts must be disappointed; and, as it has been well said here, the expense of training a horse is enormous. Of course, out of those two hundred and twenty-five horses, there will be more than two hundred that will disappoint the expectations of their owners, and they will fail to get a return for the money expended. The cost of training a horse one year will eat up his value, and more than that. Therefore I am opposed to the breeding of horses for the track. Then, in connection with that, is the gambling that is carried on. I

suppose you all know about that as well as I do. I have been through the ring, and know all about the inside of this matter of gambling, — the pools that are sold, and the amount of money that is put at stake. If that was carried on in any of our cities or towns, the parties would have the authorities down upon them: but at the track it seems to be all right; you can gamble there. I know, that, when we see a horse start off, we get interested in Mr. So-and-So's horse, and we are apt to put our hands into our pockets, and put up five dollars, and perhaps a great deal more, when we ought not to. The whole thing is exciting and demoralizing; and therefore I go against it on that ground, if on no other.

I have not time to say much on the question of breeding; but I want to say one thing: be sure you breed from perfect animals. Do not breed from a mare because she has given out here or there, or has some defect. If there is any defect in the mare or horse, it is just as sure to be transmitted as can be. I have had a little experience in this way. I own a mare which no money would buy, because I bred her. I owned her mother and her grandmother before her. Her descent was in a direct line from old Sherman Morgan. The grandmother was thirty-three years old when she died on my hands, and she was a grand-daughter of old Sherman Morgan. A spavin came out upon the old horse; and that spavin has followed his descendants all the way down, and appears in the mare that I drive to-day. But for that spavin, I would not take a thousand dollars for her. I am hoping now to get her so that she will not go lame. I remember a well-known stock horse that had a ring-bone in his foot; and almost invariably his colts had ring-bones in their feet. Then I remember another horse that came from New York forty years ago, — a celebrated horse in his day (that is, so far as looks, and so on, were concerned); but he was so vicious that nobody could handle him. That horse was never driven, to my recollection; and all the colts that came from him were utterly vicious, but all good-looking. There was not one of them that could be broken so that it could be made useful on the farm, or as a driving-horse.

The question of the influence of the male and female on their progeny has been much discussed. I suppose it is a scientific question not yet settled. I don't pretend to under-

stand it; but I know some few facts about it. The impression is, that the character of the first horse put to a mare influences all her future progeny. A gentleman who lives in the town adjoining mine had a mare that he put the first time to a black stallion, and afterwards put her to all kinds of stallions; but every one of her colts was black. I don't pretend to say that there is any thing in that: I only state the fact. As I said before, I think we should be always sure to breed from a perfect horse. I am a great admirer of the Morgan breed, although I do not think they have a great deal of the original blood in them: of course, it is greatly diluted; but still I think that there is no horse that will do our work under all circumstances, and keep his looks, so well as a Morgan horse. If we could get some of the original blood, and keep it, we should have a very desirable breed of horses. There is very little of it that crops out now, even in the Vermont Morgans, as we used to call this breed.

I have here a little extract, taken from "The Contemporary Review" of London, in regard to the expense of breeding racing-horses in England; and perhaps it may be interesting to you. It shows that the amount invested in race-horses in all departments — breeding, training, &c. — is 1,723,000 guineas. The interest on that, at five per cent, is £90,450 per annum, or $452,250. The interest sunk is but a small part of the expense. The annual expense of keeping a race-horse is £250, or $1,250, including training and all expenses. The whole amount is as follows: —

Interest on capital invested . .	£90,450
Annual keeping and training . .	583,500
	£673,950 ($3,369,750)

This is the expense of keeping and training horses for the turf in England; and the same thing is true in regard to the expense involved in the business in this country. I was well pleased with the remarks of the gentleman on that subject, and nobody can gainsay them, although, undoubtedly, there is a great variety of opinion here on that subject.

Dr. HUNT of Waltham. I must say that I have been

very much edified by the lecture. I think it would not be possible to put thought into more elegant language than we have had here. Most of it, certainly, meets my commendation; but I cannot give it that sweeping approbation that the gentleman from New Hampshire did. He said that he indorsed it unqualifiedly throughout. There was one proposition, which was stated without any qualification, that I do not believe in it at all; and in order to get up a little discussion here, and to start a sort of personal combat, I am going to begin where I disagree. The statement was this: that all the diseases of horses' feet proceed from the shoeing; and the speaker said that it was from incompetent or ignorant mechanics. Now, we have some mechanics here, and they are pretty sensible men; and that proposition will get some hard raps before this meeting is through. I dissent from it most unqualifiedly: I believe directly the opposite from that.

I have owned and driven horses thirty years, and I have never, in a single instance, seen a disease in a horse's foot which proceeded from the shoeing of the blacksmith, when he had his own way; and some blacksmiths who have done work for me are here to-day. I say I have never seen a single instance. I have heard one blacksmith accuse another of producing a given disease. You know how it is. When a man's horse is lame, it is a very nice thing to attribute it to the shoeing, because he is going to cure it, and sell the horse. He goes to another blacksmith, and says, "My horse has been injured by shoeing;" and the blacksmith says, "Yes." But he is a competitor of the other man. Blacksmiths, I am sorry to say, are not above disparaging each other; and one blacksmith will say, — I don't know whether he believes it or not, — that the trouble was produced by the work done by another blacksmith.

Now, I will tell you how the disease is produced. I drive my horse in the spring of the year. There is mud in the road, and snow-water only just above the freezing-point. I stop at some place, and let him stand half an hour; then I get in and drive four miles, not enough to warm his feet, and then he stands another half-hour. I do not know any thing about the case when he is put up at night: his feet have been chilled, and they remain in that condition over

night. When I go out in the morning and take up his feet, they are very hot, and full of fever. How many men ever do a thing to cure that horse's feet? They are already in a state of inflammation. He has not been sent to the blacksmith. Who does any thing to cure that? There is not one in this audience, I will venture to say, who has done a single thing for his horse's feet when in that condition. If anybody has, let him say so. I know the history of this thing: I have inquired into it. The result of the fever and inflammation is, that the feet begin to contract, and the horse cannot bear his weight upon them. Did shoeing do it? Not a bit. Lack of care, and oversight, and attention, on the part of the proprietor of the horse, did it. Do not lay it to the blacksmith: he is not to blame, and he cannot cure it. You need not run from one blacksmith to another to cure it. Nothing can cure it. The horse is good for nothing: he is lost forever. The loss I have suffered in horses has been owing to my own carelessness or neglect, chiefly; though I have unfortunately bought a few that had defects of which I was not aware at the time, and I got cheated.

We may say that shoeing hurts horses. But every man is mighty wise who owns a horse; and one man goes to the blacksmith, and says, "Put on shoes with heels as thin as a cent, and toes half an inch thick." Well, the man is paid for doing the work; and he does it. Then another man comes to him, and says, "Put shoes on my horse with high heel-calkins, and no toe-calkins," and he does it. You can understand that such kind of shoeing may possibly, in some instances, suit, but not usually; and I think that manner of calking has done mischief. It has been owing to the proprietor attempting to teach the mechanic how to shoe. That is the way the trouble has been caused; and the mechanic is not to blame.

In regard to the communication of qualities by the sire and dam to the progeny, I think there is an infallible rule about it. You do not need to theorize on it. I think I can put it in very few words. This rule extends throughout the animal kingdom: you see it in the human species, and there is where I got my information. You let two persons have issue: they may have ten children, and, if one of those

parents has predominating qualities, those predominating qualities will appear in the offspring. If the man is a firm, set, unyielding man, and his wife is a submissive, gentle woman, nine times out of ten, the man will impress his qualities on the offspring. On the other hand, if the woman is resolute, determined, and has her own way, she will impress herself on the offspring. That is the result of observation merely: I have not read any thing about it in books. I put that proposition down squarely for you to book against to-day. It is going to stand the test of time.

As to the matter of pedigree, I believe something in it; but I believe a great deal less in book pedigree than I do in photograph pedigree. Show me the photographs of ten generations, and tell me what they have done, and I will tell you what they are going to produce. It is the long production of given qualities that is going to tell in the end. In order to get an excellent mare, or an excellent horse to draw, you want to find a horse that inherits that quality. You will get a much better result from such an animal than from one that has a mixture of trotting and drawing qualities. If you attempt to raise horses for speed, you are going to make a loss: that is plain enough. But there are natural qualities which are reproduced in larger degree than speed, and those are the qualities that will bring money; and, if you produce them, you will not make a losing business of raising stock. Those qualities are style, size, beauty, docility. Horses possessing those qualities are what everybody wants. Every professional man, every gentleman, every mechanic, who uses horses, wants them. Very few want a horse for speed merely. Everybody says, "Give us a ten hundred horse, that looks noble, grand. Give us one that carries his head up, arches his neck, and lets his tail flow out. Give us one that has a glossy coat, a lean head, and clean limbs. Let us have style. Let us have one with a good action. Let us have one with a sweet disposition." Why, some horses are not worth keeping, on account of their temper. I would not have them. My wife said to me once, "Why don't you sell that horse? You are mad all the time." I was; I couldn't help it: and nobody could live with such a horse near him without being mad all the time. I could do nothing with him. He was good to travel and work, but he was a

miserable horse to have; and I got rid of him. An evil disposition is transmitted just as much as any other quality, perhaps more: so I say, Get your form, get your size, get your beauty, get your style, get your action, get your disposition, and bring them down through a long line; and, when you start another one from similar horses, you will have similar qualities, and in that way you will get horses that will bring you money.

In regard to the management of horses, what the lecturer said was very beautiful. I believe in that through and through. He said something like this: "Let no man attempt to break a horse until he has broken himself." Let no man come into my stable who is going to jerk or kick my horse. That will never do. That is not the way to begin. What is wanted is kindness and firmness. I think the gentleman said, "A steel hand in a velvet glove." That is beautiful, and that is true. When you attempt to do a thing with a colt, be sure you do it, but do it in a pleasant, agreeable way; and it can be done so better than in any other way. I believe in that fully.

I indorse also what the gentleman said in regard to feeding most fully. You let a colt become stunted, and no amount of feeding will ever bring him up: you cannot make a horse of him. He is lost just as much as though he had a contracted foot. He is a scrub, good for nothing. You can breed up just as well as you can breed down. The breeding down is plain enough. Look at the Mexican mustangs, or Indian ponies, with their long, shaggy manes and bushy tails, their big heads and small frames. They will endure any amount of abuse; they will live on almost any thing; the weather is nothing to them: but they have no aptitudes; they have no style; they have no beauty. They are not the colts that civilization wants; but they were the colts that Chief Joseph wanted when he fled from our soldiers, who could not catch him with the best horses of America: but he could be stopped by Miles, who was in his track. That is breeding down. They came from the real Andalusian blood of Spain, taken to Mexico by Cortez. See how they have gone down! If we can go one way, we can go the other. Take your colts, and breed them up: I think you can bring out a style of horse that you can depend upon almost

universally. You can increase such qualities as beauty of form, style, and gentleness of disposition, almost as you please. But I believe there is a limit to the increase of speed. I consider speed an accidental thing that may happen in any family of horses. Nobody has any right to expect its reproduction in the offspring. It is an accidental quality; and, if a man gets it, he is mighty lucky. But it will not do to rely upon it: give us, rather, a generous, noble, large, elegant, good-dispositioned horse.

QUESTION. I should like to ask the last speaker a few questions. I have been very much interested in the subject of horse-shoeing for the last year or two. I have never been able to find a blacksmith, who, if left alone, would keep a horse going well. I have been in the habit of driving my horses very much as the doctor does. I drive very fast at times; and they are standing about in the snow and slush a great deal of the time. I would like to have him explain how his blacksmith has been in the habit of shoeing so as to keep his horses going well, and how he takes care of his horses when they come in.

DR. HUNT. I have but very little to say on that, only that I have never seen a horse's foot made hot by any shoe put on it. I tell my blacksmiths, when they put a shoe on, to heat it red-hot. I want the shoe perfectly fitted first, and then they may heat it red-hot. I want it so hot, that it will make a perfect mark around the foot. It will not scorch any thing to do any harm: it only makes a slight burn on the dead part of the hoof, which is no damage whatever: the life is farther up. That does not do any harm; and it is the only way in which a blacksmith can set a shoe as it should be set, so that there will be a perfectly even bearing. I have never known a blacksmith to shoe a horse in that way with any bad result. I never saw a horse's foot made hot by travelling any ordinary drive, as the result of such shoeing. I do not know what harm could come from such shoeing anyway; so that I can simply answer the question by saying that I have never known any harm to be produced. I cannot prove a negative. If the gentleman wants to know how it is that it has never happened, of course I cannot answer; but I do know what causes the trouble as I have explained. Sometimes, if you drive one of these "pounding" horses a

long journey, he will get hot feet, and inflammation will set in; but do not let the owner of such a horse say that it is owing to the shoeing. It is not: it is owing to the "pounding" of the horse.

QUESTION. What would you do to prevent the fever?

Dr. HUNT. The first time I went to the stable after putting him into his stall, I should examine his feet; and, if I found them hot, I would cool them with cold water, just as I would apply cold water to my own hand. I should bathe them, and, if that was not enough, I would put a cold pack around them; and, when I had brought the temperature to the natural state, I should leave the horse. If the fever came in again, I should repeat the process, until the season got by when we ruin our horses, which is largely in the spring of the year.

Mr. HUTCHINSON of Sutton. I believe that the shoeing of horses and oxen is a necessary evil. They have got to be shod forward to go on our rough roads. They do not come into the world shod; and, if they could have their own way, I do not believe they would have any iron nailed on their feet. I have a mare, eight or nine years old, which I raised, and which I use for a family horse, that has never had a shoe on behind, except in specially icy times in winter: I am obliged then to keep her shod. I have never known her to take a misstep behind when the shoes were off, though she has when the shoes were put on behind, from a pinching shoe. The doctor says, that when horses come in, after standing in snow and slush, their feet are feverish. I would ask, Is it not the shoe that does it? Is it not the shoe that makes the horse ball up? Is it not the shoe that holds water, and produces this cold and this fever? I believe, as I said in the first place, that shoeing is a necessary evil, and that an immense amount of damage to horses is done by shoeing. I do not believe that every man who pretends to know how to shoe a horse does know how.

There was one point in the essay in regard to breeding horses, as to which I can state a fact which has come under my observation. I raised a pair of colts from a mare by the same horse. The first foal had not the slightest resemblance to the mare. The next year I put her to the same horse, and you could not see a sign of the horse in the foal: it was all mare. I never saw two colts so unlike.

Mr. WHITTAKER of Needham. I think the doctor's remarks were very good with regard to his horse suffering from cold feet. We have all of us, at one time or another, felt in ourselves what it is to be out a whole day in slush and cold, and go home with cold feet; and probably a good many of us have taken severe colds from doing so. In such cases I apply the same remedy to my horse that I apply to myself. When I have been out the whole day in cold and slush, and come home with my feet very wet and cold, the first thing I do is to put them in warm water up to my knees, to restore the natural heat as quickly as possible; and, when my horse has been out in the same way, I wash her feet with warm water, and have them rubbed dry. I think that is much better than waiting to see whether there is any fever afterwards. I know they will be cold; and I bring the blood as quickly as possible down into the feet, which has been prevented from going there on account of the closing of the veins and arteries.

I have another difficulty with my horse's feet; and that is in summer-time, when the ground is dry and hard, and when my stable-floor is dry and hard. I scarcely ever find a blacksmith who keeps a tool so sharp that it will pare the hoofs. I find a difficulty with the hoofs on account of their being dry and hard. I think a great many troubles arise to horses' feet from bad and injudicious shoeing; and I think a great many other difficulties arise in horses' feet from injudicious management and driving. I think one of the difficulties comes from driving horses, particularly heavy horses that step high, down a steep hill at a great speed. I think it not only injures the horse's feet, but it has a very bad effect on the horse's shoulder, because the whole weight of that horse is thrown upon one foot. It is a great deal worse to drive a horse fast on a trot down hill than it is to put him into a dead-run. When he is running, all four of his feet sustain his weight; but, when he is trotting, one foot takes the whole weight of the horse as it comes down, which has a bad effect both on the feet and on the shoulder.

In regard to this matter of transmitting the powers of a horse to its progeny, I think one feature has been overlooked by every one to-day, and I think it was entirely overlooked by Mr. Russell. He said that keeping a horse in

a box-stall or a stable, and feeding high, had a bad effect. That is no doubt true. But you take a horse that is limited to the service of about a dozen mares, and that horse will be very likely to transmit his qualities, whatever they may be, to his progeny; but you take a horse that has to serve an unlimited number of mares, perhaps five or six in a day, twenty or thirty in a week, and you will not have very many of his qualities transmitted: they will be bad qualities, at any rate. I have known cases of that kind a great many times; and I think, Mr. Chairman, that you can scarcely put your finger on a single case where a good horse has been allowed to serve mares at a low price, and had to serve an unlimited number, that ever produced good stock. I think the fact stated by the gentleman who said that he put his mare to one horse, and her properties were not transmitted, and then again to the same horse, and her properties were transmitted, might be accounted for in this way, — that, the first time, the mare was put to the horse after he had served a great many mares previously, and the next time she was put to him when he had not served a mare for a week or two, perhaps. You will find that a great deal depends on the manner in which you use your animal. I have protested, time and time again, to a person who kept a thoroughbred bull, because that bull could not transmit his properties to the cows that went to be served, because he was allowing that bull to run three or four times to one cow, whereas he would have been just as likely to get a calf with one service as with three or four. One of the worst processes to which you can subject an animal is to try to make too much money by allowing him to serve too many animals. If you want to have good stock from good ancestors, be sure and find out how the ancestors have been used.

Mr. WILLIAMS of Waltham. Mr. Bowditch of Framingham, who is here, has paid great attention, as I understand, to horse-shoeing. I think it will be very interesting to this audience, and it certainly will be to me, if he will explain his theory and practice.

Mr. E. F. BOWDITCH of Framingham. I would say, in the commencement, that I have taken a good deal of interest in shoeing horses for the last few years. I am a pupil of Mr. Russell in that respect. The doctor who has been

talking about the trouble he has had with his lame horse makes me think of the way that I began to take an interest in this matter of shoeing. I had the same trouble that he had, — of horses with hot feet; and I found that they could not be shod so as to avoid getting that heat. A horse's foot in a state of nature, when it is worn down properly, is wide at the heel, and the toes are worn down; the bars are in a perfect condition; and it has a wide, elastic frog, which takes all the jar from the foot. The cause of heat in a horse's foot is, no doubt, the jarring of the laminæ of the foot. The outside of a horse's foot, as we all know, when it is hot, is very sensitive and very tender, and causes the horse acute pain. You very often see a horse that is afraid to put his foot down, it hurts him so. Why does it hurt him? Why has his foot got into that condition? It is because, in shoeing, the frog, which Nature meant to take the jar of the foot, has not been allowed to come on the ground, and it becomes a dried and shrivelled-up little thing, of no use at all. And, when it shrivels, the heel contracts, and, as the heel contracts, it pinches on the small bone of the foot, called the "coffin" bone. It presses on that, and gets up an inflammation; and, when the laminæ get inflamed, very often it produces pus; and we all know how painful it is when we have a felon, or any thing like that, on our finger, particularly when there is no escape for it. You cannot get at the pus in the laminæ of a horse's foot; and there is no way to relieve that, except by giving him a long rest, and shoeing him properly; that is, putting on as little iron as possible. Let it cover the toe of the foot, and let the frog come down, so that it will take the jar of the horse's foot, and, in ninety-nine cases out of a hundred, the foot will get well. One gentleman speaks of the great weight that comes upon the foot of a horse when he is trotted down hill. I cannot say that I agree with him there, because I am afraid that I drive very hard down hill. I am in the habit of driving "cripples." My friends have a good deal to say about the "corpses" that I drive; but I take care of their feet, and take care of their frogs; and they generally manage to do good work. I make my best time in driving down hill. The horse has nothing to pull, and only needs to go. I have no fear of hard roads, and no fear of pavements,

if a horse's foot is kept in proper condition. My way of shoeing is to get a level bearing on the horse's foot, and keep the frog on the ground; never have any heel or toe calk, except when it is absolutely necessary in winter. The last winter, I rode my saddle mare (and of course my neck is worth more to me than any thing else I own) on glare ice, with a small bit of iron, about four inches long, curled around her toe, and with a very small toe-calk. I recollect galloping out on the ice, where the men were at work cutting the ice, and I had no fear of her slipping, although the horse that was marking the ice, that had calks on two inches high, did slip. I am sorry that I am not more used to speaking: perhaps I could explain myself better. But I am willing to answer any questions.

QUESTION. Do you practise paring off the bottom of the hoof before putting the shoe on?

Mr. BOWDITCH. No. One great thing is to take off as little as possible. You merely want to cut a little bit off of the edge where your shoe is going; so that, when you have got your iron on, the frog will be sure to come down, and take the jar on the foot. No matter if there is a large flake which stands off: leave it there, for it may save the horse from getting hurt when going down hill. There may be a piece of iron in the road (a nut, as happened in one case to myself), and, if the horse steps on that, it may lame him. That flake is dead: it is worn off on the road, and sometimes drops off in the road or in the stable.

QUESTION. Do you have the shoes put on red-hot, as the doctor does?

Mr. BOWDITCH. I like to have my blacksmith put the shoe on as hot as he can bear it in his hand.

QUESTION. Do you touch the frog at all?

Mr. BOWDITCH. I never touch the frog in any way, no matter how ragged it may be.

QUESTION. Or the bar?

Mr. BOWDITCH. Never, except that the bar may work down so that it will strike before your shoe: in that case, shave it off a little.

Mr. JOHNSON of Framingham. In case of a horse whose frog was shrunk up into the foot, have you ever known a frog-bearing to fail to benefit him?

Mr. Bowditch. It will benefit him, if that method of shoeing is kept up: I know that by experience. I very often have cripples come to my forge; and, when they get to going well, they go back to their own blacksmith: their owners do not think it worth while to bring them to me. When the little "corpse" that I drive came to me, her heel was about an inch and three-quarters wide, and her frog was the size of my little finger. Now she has a frog that fills up almost the whole of her foot.

Dr. Wakefield. This gentleman says that he shoes his "cripples." I would like to ask him whether, in his experience in shoeing gentlemen's horses, they travel any better than when they are shod in the ordinary way.

Mr. Bowditch. I have had some little experience in that, because I started a little forge on my own farm for my own protection. I could not get a blacksmith to do as I wanted him to do. The great trouble is, that men want to get the most for their money; that is, the most weight of iron you can possibly put on for the money. There is hardly a person who owns a driving-horse, who, if you put four inches of iron on the toe, would feel that he could go more than half a mile from home without the horse breaking down. But I do not think I could go quite as far as my friend Mr. Russell. I generally like to have a three-quarter pound shoe for my own horse. But the whole secret is, if you have a horse whose feet have been abused for a series of years, all that is required is a little piece on the toe. I generally leave the heel entirely bare.

Dr. Wakefield. Have you had any experience in shoeing gentlemen's horses, so that you can compare your manner with shoeing with the ordinary way? I am aware that gentlemen like to have a great amount of iron put on, and I am aware that they like to have the blacksmith shoe their horses just as they order. I do myself. But what I want to find out is, what is the best manner of shoeing. Can you show that horses shod in your method will travel well, and that they are not subject to those diseases which come, as many think, from exposure to cold, as has been represented here by Dr. Hunt? We all know that there are diseases of horses' feet; and if we can ascertain the cause, and, knowing the cause, avoid it, and save all this trouble to horses' feet, we shall have gained a great point.

Mr. Bowditch. All I can say is, that I have been interested in shoeing horses for more than two years; and I have never had any trouble with my own horses' feet, without any special care to speak of, merely from the effect of shoeing. Nine hundred and ninety-nine thousandths of all the trouble in horses' feet come from shoeing: in fact, practically all. To illustrate: this "corpse" that I speak of, that I drive fast down hill occasionally, belonged to a friend of mine, and was in the knacker's yard to be killed. She was to be killed, because the doctor who had her in charge wanted her legs as specimens of inflammatory rheumatism. I asked my friend, as a favor, if he would let me take her, because I did not think she had inflammatory rheumatism, and I would like to try and cure her; and, if I did not succeed, the legs should go to the veterinary who wanted them as specimens. I had to bring her sixteen miles; and it took me eight hours, with a man leading her, and a boy behind switching her; and, as they express it in the country, every leg was in front of her. She had a little shrivelled frog. I cut her hoofs very low indeed, until I got a little bit of frog-bearing; but it hurt her to put her foot to the ground. The frog had no life in it, no circulation. About two months after I took her, I thought I would try her, and see if it was inflammatory rheumatism. She took her eighteen miles in an hour and a half, although she was a little lame. I was satisfied she would come out perfectly sound. To-day I am driving that mare. She has never had her frog off of the ground since I had her, winter or summer. Her heel is steadily growing wider, and her frog is growing every day. I have driven her, within the last fortnight, from Boston to my farm, some twenty-three miles. I can do that with this little mare in an hour and forty minutes, and repeat it the same day in an hour and forty-five minutes, and she will not go lame a single step. She will go in the middle of the road, and step on stones without flinching.

Question. How would you shoe heavy draught-horses?

Mr. Bowditch. Put on as little iron as you can get on; never a heel or toe calk.

Mr. ——. My horses slip when the calks are worn down.

Mr. Bowditch. As horses are generally shod, the thickness of the shoe, without a heel-calk, keeps the frog from touching the ground.

QUESTION. Have you ever tried the experiment with heavy draught-horses?

Mr. BOWDITCH. I have some heavy horses, and they go with seven or eight ounces on their feet.

Mr. FLINT. I would like to inquire whether there are any patent elastic shoes which Mr. Bowditch has examined, which he has any confidence in.

Mr. BOWDITCH. The shoe that I use is the Goodenough Horse-shoe, which is made on the theory that the proper way to shoe a horse is to put his frog on the ground. The easiest and cheapest way to accomplish this is to use the Goodenough Horse-shoe. The little forge I speak of I run on that principle. I am not liked by a good many who come there, because I have a rule, and I will not shoe as any one wants me to. Therefore I do not make so much money as I otherwise might; but I think I have fewer lame horses.

QUESTION. Will you draw that shoe for us?

Mr. BOWDITCH. I do not think I can. I would rather try to hammer one out than draw it.

Mr. RUSSELL. I learned the theory of horse-shoeing which I have practised, from the man who promulgated the true theory both in this country and in France, — Mr. Goodenough. Mr. Bowditch has been kind enough to say that he is my pupil, and he has carried it into practice a great deal more than I have. Mr. Goodenough's idea was always to shoe a horse so as to get the frog-pressure, as he called it; that is, so that the frog of the horse invariably came upon the ground. I do not want to advocate the use of any shoe, or any man's patent, before this audience. I only speak of it, because Mr. Bowditch has referred to the Goodenough Horse-shoe as a convenience in that method of horse-shoeing. In France it is carried on under the name of the Charlier system. The Charlier Shoe is just a little rim of iron put about the hoof, set in a groove, so that the whole bottom of the horse's foot comes directly upon the ground when he is travelling, — the frog, bar, sole, and the whole of the bottom of the foot, just like a barefooted horse. It is only the rim of the hoof that is protected. That is an expensive way of shoeing, and is only adapted to a country where the mechanics work with great nicety and slowly, as in France, where one man holds the foot, and another places the shoe,

and makes a job of it that we could not afford to do in this country. The reason for using the Goodenough Shoe in Mr. Bowditch's forge was because it kept the principle continually before the man who was shoeing, and enabled him to shoe his horse with frog-pressure. The heel of the Goodenough Shoe is drawn thin. It is a rolled shoe, and it is rolled thin. The shoe is also bevelled on each side. It is bevelled on the foot-surface, the part of the shoe that goes against the foot; so that the bearing of the horse comes upon the outer wall of the hoof entirely. It is bevelled on the inside, which prevents the balling of snow, or suction in mud; which is a very important matter. And then, in rolling up, it is corrugated. There are three depressions in which the nails are counter-sunk, so that the heads of the nails do not strike the ground until the shoe is very well worn down. Mr. Bowditch and myself have found it for our convenience to use that shoe; and, as I say, it keeps the principle before the horse-shoer: but any man who will take the pains can shoe his horse in the same way without the use of any special shoe for that purpose.

Mr. Brooks of ——. I have heard a great deal of talk on this subject; and what was said seemed very reasonable, and I did not know enough to contradict it. Last spring I bought a horse that I had always fancied very much, with unsound fore-feet. He had been shod in Boston, and brought into the country, because the city smiths said he would do very well on soft roads, but would not do very well on the pavements. I tried to get them to have the horse shod in this way, as a matter of experiment; but they did not dare to. I bought the horse more for the purpose of trying it than any thing else, and took him down to Mr. Bowditch's forge. He took the round shoes off, pared the hoofs down, put him in a box-stall on sawdust during the day, and let him run out on the damp grass at night. I went up and saw the horse after his shoes had been off two or three days, and he was a perfect cripple. After two or three weeks more, I went up again, and he had some light shoes on, and was jogging about a little. He had a crack in his hoof, which is now nearly gone, and I have driven him around in Boston and Cambridge, and he has not taken a lame step. The heat has entirely disappeared which was in

his feet when the round shoes were on, and I expect he will soon have perfectly sound feet.

Mr. JOHNSON of Framingham. Some eight or ten years ago I bought a heavy pair of colts over in Newton. I had been troubled with my horses' feet getting out of order; and I had attributed it to the blacksmith in a great degree, for I scarcely found one who was willing to shoe a horse as I wanted to have him. I was in the habit of taking those colts to Waltham; and Mr. Daniels shod those colts for me for a long time, and he did first-rate with them. Before Mr. Bowditch opened his shop, I had a small horse which was shod at the same shop that Mr. Bowditch's horses were shod at; but that man, although he was a good shoer, did not want to shoe my heavy horses. He showed me what Mr. Bowditch calls the "Goodenough Shoe;" and I assure you it is *good enough* for anybody to use. I went to him to get a set of shoes for my horses. But he had but one shoe, and he said, "Mr. Bowditch is going to try those shoes: let him try them first: he is able. I don't believe in this nonsense, Johnson." I did not get the shoes until Mr. Bowditch opened his shop, three years ago; and my three horses have been shod there ever since. The two horses I speak of weigh about twenty-seven hundred pounds. One of them particularly is a horse that goes in a carryall a great deal, and travels over our hard, stony roads. The frog of his foot is upon the ground all the time: it is full flush to-day with the shoe. I have him shod with what is called a full shoe,—no calk at the toe, and no rise at the heel, of course; but it comes down gradually. The small horse has a frog in his foot that is as broad as my hand; and you may take a light hammer and thump it, and you will see no shrinking, except from the nervousness of the horse. His feet to-day are all there is of him, you might say, that is valuable; but they are worth a hundred dollars more than they were when he first went to his shop.

I am fully convinced that the proper method of shoeing a horse is to shoe him so that the frog shall come on the ground. A little too heavy shoe was put on the little horse I have referred to, because the blacksmith was out of light shoes of the right size, and he said he would go as well with those shoes as he would with lighter ones; but, in the course

of a week or two, he said, "Bring that horse over: he don't go as well." He was taken over, and a light shoe put on him, and he went as well as ever.

Mr. Bowditch's horses go down hill rapidly. I shall not uphold him in that. It is said he needs iron horses to stand it. But, so far as the feet of his horses are concerned, you seldom see one that is limping.

QUESTION. Would Mr. Bowditch omit calks from the shoes of heavy horses that are driven on city pavements?

Mr. BOWDITCH. I would omit calks unless they are absolutely necessary. When it is icy, you cannot get along without something in the way of calks. But that is a necessary evil. If you can shoe your horse properly for nine months in the year, he will stand abuse for three months. You can get along in that way; but never use calks unless you are obliged to. My horses come to the city; and I have asked the teamsters repeatedly, "Do the horses slip on the pavement?" The reply has always been, "Never, sir."

Mr. ——. Not many weeks since, my horse slipped on the pavement, and I attributed it to his being smooth. I am in the habit of having blunt calks put on my horses' feet. I have had the impression that they stood better when they had those calks on, especially when I drive on the pavements. When in the country, I do not feel the need of them. But I remember well, some years ago, when I was in Paris, I was struck with something that seemed very peculiar in the management of dray horses in the streets. They were treated the same as Connecticut girls are before they weed onions. The girls have knee-patches; and those horses were equipped with knee-pads. I noticed, to my surprise, that they not infrequently slipped in the streets, which were wet, as a general thing, in the cold season; and, as a safeguard, many of the horses had leather pads on their knees, so that when they fell, and came down upon their knees, the pads would protect them somewhat.

I wish, while I am up, to make a single remark with regard to what the gentleman from New Hampshire (Col. Humphrey) said about breeding. He instanced a mare that was first covered by a black stallion, and subsequently by various other horses of different colors; but all the progeny were black. That, of course, only goes so far as color is con-

cerned; but it brought forcibly to my mind a remark that Professor Agassiz made to me a few years before his death, which was this: that he had noticed, that, if a mare was covered in the first instance by a scrub, the whole of her future progeny were scrubs, no matter how highly bred the horse was. He said that this applied not merely to horses, but the same rule held good in the bovine race; that if a cow was covered in the first instance by a mean, unworthy sire, her future progeny, no matter by what bull she was covered, partook of the mean character of the first sire: a high-bred calf could not be had. The same rule, Professor Agassiz said, held good with the dog, and with other animals. This, I am aware, is a nut for scientists to crack; but it is certainly worthy of the observation of all breeders of stock, or animals of any kind.

Mr. WILLIAMS of Waltham. If there are no more questions to be asked in regard to the shoeing of horses, there is a question I want to ask the essayist; and that is, whether, if I wish to repeat the qualities of either sire or dam, one more than the other, there is any way by which I can do so; if, for instance, by putting the male into a state of excitement, if I wished to repeat the male, and keeping the mare in a state of perfect quiet at the time of service, I should be more likely to repeat the male in the progeny, or *vice versa*, if I wished to repeat the female.

Mr. RUSSELL. That question has been very often raised. A great deal has been said upon it; and there are instances, on record in which breeders have experimented in that way. There was a case in which Sir Tatton Sykes, a distinguished English breeder, wished to perpetuate the qualities of a horse called "Muley-Moloch," a celebrated race-horse. He and his stud-keeper brought out the mare, and kept the horse for half or three-quarters of an hour in the presence of the mare, and walking about her; and they contended and believed that the progeny of that cover embodied the highest qualities of the horse. That was a case in which the two animals were of equal lineage, and probably of equal powers. The mare was one of the very first of her class of English thorough-bred mares; and the horse was, perhaps, the very best horse of his day in England as a sire, so that the proof might have been good in that case; but if the horse

had been inferior to the mare, if he had been a "scrub," so called, a low-bred, cold-blooded horse, and the mare had been a high-bred animal, with hot, powerful, and strenuous blood, inherited from a line of ancestors of similar quality, I doubt if they would have had any such proof to give from their experiment. The strong parent, the strong blood, the high lineage, will prevail in breeding, however you may prepare the parents at the time. And then comes in the fact that you rarely get a progeny that is like either your dam or sire. They throw back whole generations in the short generations of animals like the dog and the horse. You notice that in families of men. Take families like the English aristocracy, some of whom have portraits of their ancestors dating back several generations; and in France also, it is no uncommon thing to see a child of the present generation that seems a reproduction of some ancestor whose portrait hangs on the wall, whose bones have mouldered in the tomb for three centuries.

Mr. WILLIAMS. It would be a sufficient answer to my question to suppose that the sire and the dam are of equal strength of blood. In the first place, unless they were both of good quality and well-bred, I do not think it would be for my interest, or any other gentleman's interest, to breed. But I may have a choice in regard to the progeny: I may wish to repeat one or the other. The question I put is, Provided they are of equal strength of blood, what would be likely to govern the character of the progeny?

Mr. RUSSELL. It was considered by Sir Tatton Sykes that he did govern it in the experiment I have cited.

Mr. WILLIAMS. I have had a little experience in that direction; and I asked the question because I wished to be indorsed if I could be: otherwise, I should have said that it was only an accident. I took a mare to "Robert Bonner," owned by Col. Russell; and, immediately after the arrival of the mare, she was served, and was then taken home. The result of that was, that I had a colt that almost precisely followed after the blood of the mare; not particularly the individual characteristics of the mare, but the characteristics of the breed which the mare was from. The year following, an accident happened to the mare, and I was unable to take her to Col. Russell's place, and he was kind enough to send

his horse to my place here in Waltham. The result of that connection is a colt that entirely follows after the breed of the horse.

Mr. ——. In the case just mentioned, the mare, in the first place, was driven to the sire, and she was freely exercised. The action of the heart was stimulated; her blood was warm; her whole muscular system was developed; the whole system of circulation was in a high state of activity; and the result of the connection was a colt that closely resembled the mare. In the last case, the stallion was driven to the mare, and he was exercised. His heart was warmed up naturally into a high state of action; the circulation of the blood was vigorous; the blood was warm; the whole muscular system was fully developed, and there was vitality there, there was life there: there was an extra condition of life. It may be that that may have something to do with this great subject; that is, that, in order to secure the best results, it is necessary to have the best conditions of life and activity in both sire and dam. Mark, that in the first case, where the mare was travelled, the result was, that her conditions were repeated: when the stallion was travelled, the result was, that his conditions were repeated.

The CHAIRMAN. I will call upon the secretary of the New-Hampshire Board of Agriculture, Mr. Adams.

Mr. J. O. ADAMS of Manchester. I had supposed that it was so near the close of the morning session, that I should not have any occasion to say a word this morning. I will say but a single word; and I do that merely to answer the call, because I am unwilling to shirk any position. But you could not have called upon me to say a word upon any subject connected with agriculture with which I am less familiar than with this. It has occurred to me, however, during the discussion that we have had, that some points, perhaps, have been omitted, or have not been made very prominent, that are worthy of some notice; and I will suggest one, at least, that I believe has hardly been touched upon; and that is the matter of breeding from immature animals. I believe the lecturer made scarcely an allusion to that.

It seems to me that it is a fault with most of our breeders, —particularly, perhaps, with those who breed neat-stock, although the breeders of horses are not exempt from the

same fault, — that they breed from very young animals. We may, perhaps, fall into the opposite error, and breed from animals that are too aged, or have been too much exhausted by former efforts; but I think the great mistake that is made is in breeding from young animals. We are very anxious, if we have a good animal, to secure its progeny as early as possible in order to save expense; and this very cupidity that we have may lead us to sacrifice greater interests in the future. If we compared the virility of animals with that of the human species, we should not generally be willing to let them breed until they were at least four or five years old: whereas we are very apt to use bulls before they are one year old, even at nine months. Horses are not used quite so young; but they are sometimes used when two or three years old, — an age quite too immature for successful service. I desired to call your attention to this, not because I could tell you any thing new upon it, but because it has not been brought up very much at this meeting.

There is another point which has escaped observation, to a considerable extent. In breeding, particularly in breeding horses, I believe it is not only necessary to have good blood, not only necessary that the animals, at the time of service, should be in good condition, but that, immediately afterwards, the mare should have proper associates. I believe she is liable to be influenced, as regards her offspring, by her associations at the time of conception with animals that are objectionable in themselves. I knew a case in point, of a mare that had been associated with a very awkward gelding, and had evidently acquired quite an attachment for him. She was put to a horse and had a colt; and the colt resembled this gelding in a very striking manner, showing the effect of association upon the mare while carrying the foal. I think this is a matter in regard to which the owners of mares are very apt to be neglectful, and especially farmers. Farmers take no pains, generally, with their breeding animals, especially with their mares. They want them for work; and they use them just as they would if they were not with foal. Special breeders guard against this error; and I wish to impress upon the minds of those who are breeding for common purposes, that they exercise a little more care in this respect.

I will not take up any more time now, because I do not

feel that I can teach you any thing on this subject, and I reproach myself for venturing to say even what I have.

President CHADBOURNE. In my lecture last night, perhaps some of you will remember that I made this statement: that, in my opinion, the germs of life are influenced in many ways that we do not understand; and that the peculiar influence brought to bear upon the germ at the time when it receives its distinct vital power, that which gives it the power of independent life, is a force that will manifest itself in the whole development of the germ. Now, in the discussions here, and in the experiments that have been referred to in regard to securing the likeness of the sire, I think I have noticed in every case (if there is any exception, I hope some one will mention it), that, where the mare has been put to the same sire twice, the likeness of the sire appeared most strongly in the second case.

Mr. HUTCHINSON. It was exactly the reverse in my case.

President CHADBOURNE. What was your case?

Mr. HUTCHINSON. I put the mare to the same horse two successive years. The first time the foal took after the horse: the second time it took after the mare very decidedly.

President CHADBOURNE. I did not hear that; but Mr. Williams gave a case of the other kind. It occurred to me that this ought to be taken into consideration. We know what Professor Agassiz said, and what all breeders recognize, — that, the first time a female is covered, the organs of generation are affected by the male in such a way, that the *chances* are (I should not go nearly so far as some have gone here this morning on this point); but I say the *chances* are, that every young of that female will have some of the characteristics of the first male that covered her. That is so well established, that I suppose any man who has a pure-bred heifer or a pure-bred mare would consider it a terrible calamity to have that female covered in the first place by a scrub. He would say, "I never expect to get any thing that is pure from her."

Now, is it reasonable to suppose that this effect is produced simply by the first covering? Is it not likely, that, whenever the female is covered, the young will not only partake of the nature of the sire, but that there is an effect produced upon that female that will last throughout? I

think it is entirely reasonable to suppose so, although I do not believe that it has the same effect as in the first instance. If that is so, then we should naturally suppose, that, as you go on putting a mare to the same sire, you will be more likely to get the characteristics of the sire in the second and third case than in the first. A case is cited which is contrary to that theory; but I did not hear that: I have heard some of the others. So you see, gentlemen, the difficulty of reaching certainty in this respect. I do not believe we have reached any certain principle except this, — that an animal that has certain qualities that you can trace back to father and grandfather, tracing them back through quite a number of generations, and being sure that they have appeared in every one of them, will be very certain to reproduce those qualities in its progeny. I think that is all the result that has been reached. As has been said here, this blood will go over three, four, eight, or ten generations. Take some of the old bulls that were brought here from the State of Maine long years ago. All their history is forgotten; but once in a while a calf is dropped that shows all the characteristics of those old bulls, whose blood has been kept out of sight for generations. It is just so in the human family. Diseases and individual characteristics go over a good many generations, and then re-appear. But if you can be sure that the good qualities of a particular animal appeared in this one before him, and that one before that, so that you can be sure they have come down permanently for a great many generations, then I think you can be very sure he will perpetuate them.

QUESTION. There is one question I would like to ask: If the progeny is not as likely to take after the horse, by keeping the stallion, as Mr. Russell said this morning, in the presence of the mare for some little time before service? I have noticed this peculiarity in breeding stock, — that a Jersey, for instance, in a herd of other thoroughbred stock, would as often mark the progeny of the other cows with a little Jersey mark around the nose, as any way. Why is it, unless the associations and surroundings at the time of serving have that effect upon the animal?

MR. RUSSELL. In the first place, I would like to say a few words upon the point that is raised by President Chadbourne.

I am a thorough believer in the power of the first parent to mark all the succeeding progeny. I believe that the sire of the mare's first foal has an influence upon every one of her progeny, fading out, perhaps, as it goes on. It is not necessary to refer to my own experience, or to anybody's experiences, except in one celebrated case. At the beginning of this century, the Duke of Richmond, I think it was, or some celebrated English statesman, took a very fine thorough-bred mare to the Zoölogical Gardens in London, and had her crossed with a wild striped ass, a quagga, from the Cape of Good Hope; and she had a foal in due course of time, bearing the stripes of the quagga. She was afterwards put to a thorough-bred horse, and she threw a foal from the thorough-bred horse strongly marked with the stripes of the quagga. They continued to breed her; and she had seven or eight foals before she got through, every one of which bore the marks of that first impress, fainter and fainter towards the last. I have refused, in several instances, to have a mare covered by a horse that once belonged to me, whose form I wished to see in the colts, because the mare had been previously covered by notorious scrubs; and I had no idea that the subsequent cover could prevail over that influence. I believe that about all breeders know that to be a fact.

In regard to the point made by the last speaker, I believe, too, that the appearance of stock is more or less influenced by their surroundings. We read in the Bible, that when Jacob served for a part of the droppings of the sheep, and the young of the ewes that were to be that were striped and spotted, he contrived to produce an extraordinary number of spotted and striped ones, by peeling wands, and sticking them up before the fulsome ewes. I have had men come to me anxious to breed from gray mares; but, fearful of getting gray stock (which is not fashionable nor so salable as other colors), they would stipulate to have a bay horse or a black horse led out to stand before the mare when she was covered; and I have no doubt that has been very influential in preventing the breeding of gray horses. In France during the last century, when they were anxious to have gray horses for posting-purposes, because it was considered more lively in dark nights to drive a team of gray horses, they followed the same practice in breeding gray horses; and everybody who

has been to France knows that that country abounds with gray horses. There are more gray horses in France than in all the rest of the world put together.

Mr. CAPEN. I believe it is a matter of observation, that if the mother is strong, vigorous, and healthy, and her conditions are dominant, and the father is delicate, or in any respect feeble or inferior, the progeny are generally females; that is, the sex follows the condition of the dominant parent. And in a case where the father is the strongest in all respects, in vigor, in vitality, in intellect, or in any of those conditions which make up life and force, the larger proportion of the progeny are males. So far as my own observation goes in that matter, the principle is well supported.

Mr. ——. I was interested in the statement of Mr. Williams in regard to his mare, which had first a colt that resembled the dam, and then one that resembled the sire; which last he attributed to the fact that the stallion was exercised in coming to Waltham. I believe that is true, from my observation and experience in breeding horses. I had a horse some two years ago that was used constantly during the season of service; that is, he was driven every day four, five, or ten miles. Sometimes he was put to the plough. And during the season he served between eighty and ninety mares; and almost every one of the colts partook of the characteristics of the horse. He was a very active, strong, resolute horse, large in size; and there was not a single foal that was deficient in energy, in strength, and hardly any that did not partake more or less of his constitution and his size; and I attribute it to the fact that he was constantly exercised. I have known horses that have been kept in the stall, and only taken out at the time of service, where the results were entirely different. I believe that is a matter that is oftentimes overlooked in the breeding of horses. Many stallions are pampered, over-fed, have no exercise; and their progeny are deficient in all the qualities that it is desired to transmit. I was very glad to hear the experience of Mr. Williams in that direction. I think it illustrates a fact.

The subject was laid on the table, the hour assigned to the question-box having arrived.

THE QUESTION-BOX.

Several questions were presented through the question-box, among them the following: —

"Would it be possible to improve the grasses by hybridization or cross-fertilization?"

Mr. Flint. I will say a few words in reply to that question. It would be possible in a few cases, but not very practicable in any. The grasses differ in their floral structure. They are not all uniform in their mode of growth. We have a class that may be called *diœcious grasses;* that is, grasses in which the male and the female, or the staminate and pistillate, organs of the flower are arranged on entirely distinct plants. That is the case with only a very limited number of species. What is called the "buffalo-grass," which grows in the South, and in Colorado, and generally on the plains, is one of that kind. I have seen patches of buffalo-grass in Colorado, composed entirely of staminate, or male plants; and other patches composed entirely of pistillate, or female plants. Now, the pistillate plants must get their pollen from the staminate plants, which may be at some distance off. It was at first supposed that they were different species, until the fact was discovered that one grass was simply a staminate, or male plant; and the other a pistillate, or female plant, both belonging to the same species. Of course the seed is produced only on the pistillate plants.

Another class of grasses may be called the *monœcious grasses;* that is, where the staminate and pistillate flowers are on the same plant, but in distinct positions, separated from each other. The most familiar example of that is our common Indian corn. Every farmer knows that the staminate flowers of Indian corn come on the top, called the "tassels;" while the pistillate flowers are arranged on an axis along the main stalk, called the "ear;" and that the pollen from the staminate flowers must find its way through the pistils, which are the silks attached to the ears, as everybody knows, before fertilization can take place. There are but few grasses which are of that kind; that is, where the plant shows both pistillate and staminate flowers, but on separate and distinct parts of the plant. Take, for instance, the common wild rice, which you find along our brooks (*Zizania aquatica*).

There the pistillate flowers are at the top of the stalk, and the staminate flowers below; so that the pollen, contrary to the other example, must rise to fertilize the germ.

Then there is another class of grasses, which may be called *polygamous grasses*, where a portion of the flowers will be wholly staminate, another portion wholly pistillate, and another and larger portion perfect, including both sexes. A few of the grasses belong to this class; for instance, some species of the panic-grasses, and a few of the wood-grasses, called *andropogon* by the botanists.

But by far the greater number, almost the whole, of our natural and cultivated grasses and grains, have perfect flowers; that is, the staminate and pistillate flowers are arranged together, and fertilization takes place in many cases before the flower opens. Those are what are called perfect flowers, where the pistils and stamens are arranged together in the same covering, and where the two parts come to maturity at the same time. Of course cross-fertilization, or fertilization from other species, could not take place in such plants; and hybridization does not take place, as it does when different varieties of Indian corn grow near each other.

Now, with regard to these perfect-flowered plants, which constitute by far the larger portion of our natural grasses, there are some peculiar circumstances which might make cross-fertilization possible. In a few of them the stigmas are thrust out of the covering before the stamens; and they will retain their fertilizing power, their freshness, but a very short time. They must get their pollen from flowers already opened. Take, for instance, our common sweet-scented vernal-grass. There the stigmas are thrust out before the stamens appear, and they must be fertilized by flowers which have previously opened before the pollen appears in its own flowers. I think there are one or two other species of grasses of that kind, as the meadow-foxtail. The reed canary-grass is another example where the stigma is thrust out before the stamen appears; but, in that case, the stigma retains its freshness longer than in the case of the sweet-scented vernal-grass. Possibly cross-fertilization might take place in such a plant as that; but practically I should say that cross-fertilization would not be possible in most of our natural grasses, though it is very common in Indian corn.

I think that answers the question sufficiently. At one o'clock the Board adjourned to two, P.M.

Afternoon Session.

The meeting was called to order at two o'clock; and the secretary of the Board was introduced, who spoke as follows, on

THE GRASS AND HAY CROP.

BY CHARLES L. FLINT.

Mr. Chairman and Gentlemen, — In my Fourth Annual Report to the Legislature, in 1856, now more than twenty years ago, I devoted over two hundred and thirty pages to a consideration of the grass and hay crop, discussing it in all its bearings. I do not propose, of course, to travel over the same ground now. The most I can expect to do is to glance at a few of the more striking points in which we have made decided progress since then, and to point out, in a somewhat desultory way, how we may increase the quantity, and improve the quality, of our grass and hay crop.

I need not, I am sure, stop to enlarge upon the importance of the subject. I need not remind you that the grass-crop lies at the very foundation of all our prosperity and success as farmers in this northern latitude. I need not say that a greater extent of land is devoted to it, that a greater value is realized from it, than from any one crop, not excepting cotton: I might almost say, than from all other crops put together. You know, that, before the late Rebellion, our Southern brethren were accustomed to boast that cotton was king; but I claim, that, if any precedence is due to any one cultivated crop over another, that claim, of right, belongs rather to the grass and hay crop. I will not attempt to prove that no successful, profitable, and progressive system of farming can be carried on without the use of manure, no matter what the climate may be, and that we depend, to a very large extent, upon the grass and hay crop for that great basis of all successful cultivation of the soil.

The great besetting sin of New-England farming has been, that we have robbed our grass-land to feed our hoed crops

and our arable lands. We have done it persistently, almost from the first settlement of the country, certainly until a very recent period; and here and there we do it even now. It is a source of some satisfaction, I am sure, to such an intelligent body of farmers as this, to feel that we have now made a turn; that, taking New England over, we are improving gradually, and perhaps as rapidly as could be expected in the other direction. Thoughtful, intelligent farmers have now come to the conclusion that it is time to give more study, more attention, and more care, to their grass-lands, and a little less perhaps, comparatively, to their cultivated lands. The old system of farming has now been abandoned on the best-managed farms, and ought to have been abandoned long ago. I remember perfectly well, — don't you? — when the grass-crop was practically considered a secondary crop, and the manure made from it went to the ploughed lands. It was, in most cases, very poor manure at that, — manure that was coarse, that was full of the butts of cornstalks, that had lain leaching under the eaves of the barn for months, until all the soluble materials had disappeared. There was no barn-cellar in my neighborhood when I was a boy; and, if there had been, the value of it would not have been understood or appreciated. The common practice was, as you know, to select some piece of run-out grass-land, which the cows, perhaps, had gnawed bare, plough it up, and put in potatoes, — a very exhausting crop, — with the manure in the hill. The next year it was planted with corn, with a lot of white beans or bush-beans in each hill; and almost invariably a pumpkin-seed or two was stuck in with them. The manure in the hill was sufficient to give all those plants a brisk and rapid start at the outset; but they had no sooner left the manure in the hill than they were drawing upon the very heart and fertility of the soil itself. The third year the farmer would generally sow oats, and a little grass-seed with them. He would cut his oats some time in midsummer, or a little later; and, if the season happened to be favorable, the grasses would make out to sustain life; but in a great many cases, as you remember very well, we had severe droughts, that killed out all the young plants after the oats were harvested. The next year, if we happened to be reasonably fortunate, we had a

feeble stand of grass, — Timothy and red-top, — which was cut, and then the field pastured to death all the fall. There was no economy, no profit, no lasting improvement of the land, in such a system as that. And yet you know — every farmer who was born and raised on a farm forty or fifty years ago knows — perfectly well, that such was the almost universal practice. What wonder that our grass-lands were run out until an average hay-crop was less than a ton to the acre!

I say we have made some progress, some improvement, since then, — a decided improvement. The popular notions in regard to the comparative value of the grass and hay crop, and the hoed or cultivated crops, have considerably changed in the last twenty years; so that, from having been accustomed to raise less than a ton to the acre, we are now raising something over a ton; and we must take hold and see if we cannot double it. How are we going to do it?

In the first place, I should say, by a greatly improved tillage of our lands and by under-draining. On the first point, the matter of tillage, I shall have something to say hereafter. As to the matter of under-draining, it has been very thoroughly discussed in my Report for 1871, and in several other Reports, by Col. Waring and others, who have gone very minutely into the question of how it should be done, the profits of it, &c.; so that I need not stop to dwell upon that point here.

I should say, in the second place, by a greater quantity, and especially a greater variety, of grass-seed in our mixtures. You know our forefathers, the Pilgrims and Puritans, sowed no grass-seed whatever. They relied upon the spontaneous productions of the soil, upon the salt-marshes lying along the seashore, or upon the bogs, swamps, or swales farther inland; and you know, if you recollect the early history of these colonies, that the towns along the seashore — Plymouth, Duxbury with its large extent of salt-marshes, Marshfield with its two thousand acres or more of open salt-marsh, Hingham, Charlestown at that time abundantly supplied with salt-marshes, Lynn, Ipswich, Newbury, all shore-towns — were settled among the first, because they afforded extensive facilities for the use of the natural productions of the salt-marshes.

The settlement of our inland towns was almost analogous to that. It is but a short time since I visited a great bowlder in the town of Grafton, under the lee of which the first white man passed the winter; and it was under these circumstances, — and I mention the fact, simply because the history of the first settlement of that town is precisely the same as the history of scores of other towns, not only in Massachusetts, but in New Hampshire, and, I suppose, in other States, — the first white man went up from Marlborough to Grafton through the woods. There were gunners and venturesome scouts in those days, as there have been since, and they went off long distances through the forests; and wherever they found a large open swamp or marsh (what we call "meadows" in this part of the State), with a luxuriant growth of swale-grasses, they marked that spot. This man had gone up in the summer, and had found what he called "Broad Meadow;" and he was so well pleased with the luxuriant grasses, that he went up and cut and stacked them; and in the fall he drove his cows up there, and kept them on the hay which had been cut in the summer. He drove them up to prevent them from starving, and to secure for himself the means of carrying his cows through the winter. This is a single isolated case; but there are hundreds of others, where, if the facts were known, you would find that the existence of large swale-meadows accounts for the fact of the first settlement, and for the fact that one locality was settled before another whose natural advantages you would suppose were greater. These bog-meadows, or swale-lands, were considered, in the early days of the colonies, the most valuable part of the farm itself.

The early settlers sowed no grass-seed, I say, for some years. They had not been accustomed to it. The first European dwellers upon these shores had to endure untold hardships, privations, and danger. They found a climate which they had never known before, a soil which the foot of white man had never trod, and natural productions with which they were not acquainted. The people in England, from which they emigrated, had not been accustomed, at that time, to grow and cut grasses for hay to any thing like the extent that they have come to practise it since then. Red clover was not introduced into England as a cultivated plant until some years after the Pilgrims had left there; and white or Dutch clover,

and many other plants which we cultivate as grasses, were not known there as cultivated plants at that time. Our forefathers, the Pilgrims and Puritans, were compelled, by the severity of the climate, to provide for much more abundant winter-supplies than their fathers before them had done.

Now, the first step of progress which they made was to collect the seeds of grasses on the barn-floor and under the hay-stacks, and sow such collections. They followed that up for some time. The next step which they made was to sow a small quantity of seeds of some of the grasses which they thought most desirable, upon the ground which they had cultivated in their hoed crops. That was practised for many years before they made any farther progress. We have improved considerably upon that. But there is another great step of progress which we must now take; and that is, to select a much larger number of varieties than we have hitherto been accustomed to select, and to sow them more abundantly. St Paul, you know, says that "he that soweth sparingly shall reap also sparingly, and he that soweth bountifully shall reap also bountifully," and that seems to be good doctrine.

Now, what has been our custom in that respect? With our fathers, the practice was to sow about twelve quarts to the acre. Many farmers now sow a larger quantity of seed, when reckoned by measure. But grass-seeds differ very much in weight. A bushel of one kind will contain a vastly greater number of seeds than a bushel of some other kinds. Now, what I wish to suggest is, to select, in the first place, a much greater number of varieties. That, I think, is one of the great points which we should bear in mind. For mowing-lots, I would select grasses that blossom about the same time. I would sow the early grasses by themselves, and the late grasses by themselves. The common custom has been to sow only clover, Timothy, and red-top. Sometimes a farmer has sown with them a little orchard-grass. But orchard-grass blossoms three or four weeks earlier than Timothy, and clover two or three weeks, at least, earlier than Timothy or red-top; so that when you sow clover, orchard-grass, Timothy, and red-top together, your orchard-grass and clover are ready to cut before the Timothy and red-top will be headed out at all, to say nothing of their being in

blossom. And many farmers will hesitate before putting in the scythe when these grasses are in that condition. They want to wait a little while; and, if they wait long enough for the red-top and Timothy to be ready to cut, the orchard-grass has become comparatively worthless; for it has gone to seed, and become hard and woody, and just about as indigestible as a chestnut rail. I do not believe there is any nutriment to be found in it when in that condition; and, if you should leave it to the judgment and taste of your cows, they would come to the same conclusion. They know what is good for them much better than we do.

Now, supposing a man should make up his mind that he will have all the early grasses together, as far as practicable, and all his late grasses together, then he can commence his haying, in some cases, by the middle of June; and he will not be anxious about the condition of his later fields, because he knows that they will be improving for a few days longer. He is not, therefore, hurried, He has greater command of his labor, and can take it leisurely: whereas, if his grasses come into condition about the same time, he knows, that, before he can get through mowing, some of his grasses will be entirely too ripe to be in their most nutritive and best condition; so that there are some advantages in making this division, — sowing the early grasses by themselves, and the late grasses by themselves. Orchard-grass is one of the earliest varieties. Then we have the June or Kentucky blue-grass, perennial rye-grass, not quite so early as orchard-grass, but considerably earlier than Timothy, the meadow-fescue, and perhaps the tall oat-grass. With these we can sow red and alsike clover advantageously. We ought to devote more attention to clover than we generally do. I know very well that most of our farmers raise it to some extent, perhaps, in some cases, to as great an extent as is advisable; but, taking the State over, I do not believe we fully appreciate the value of clover, or give sufficient attention to it. Clover is a very peculiar plant. It is a plant which really fertilizes and improves the soil, rather than the reverse. You know that if corn, or any of our ordinary crops, is allowed to ripen its seed, it is exhausting to the soil. It takes out a great many of the fertilizing elements from the soil to build up its structure; and the soil is, of course, exhausted in proportion

to that extraction. Clover is an exception to other crops in that respect. It not only stores up in its roots a large amount of nitrogen, but if it is allowed to stand to be cut for hay, and especially if it is allowed to ripen its seed, it adds a vast amount of nitrogenous elements to the soil through the falling and the decay of its leaves. It is a wonderful exception, in that respect, to our cultivated grasses and other crops. The roots of clover extend down deep, as you know, and get a considerable portion of their sustenance from the subsoil. Then all these broad-leaved plants derive a large proportion of their nutriment from the atmosphere. These elements are stored up, partly in the stalk, partly in the root, and, to a much larger extent in the soil itself, while the clover remains in it. A careful investigation has shown that an ordinary fair average acre of clover-roots will contain over fifty pounds of nitrogen or nitrogenous compounds; and the soil itself, after the clover-crop has been cut for hay, or allowed to ripen its seed, is filled with nitrogen and its compounds to a much greater extent than it would be by applying a full and complete dressing of nitrate of soda, or any other nitrogenous manure on the surface in the spring. It is a remarkable fact, that while clover takes out of the soil as much, perhaps, of some of the elements of fertility as our other crops (more than wheat or other cereals), it leaves in it a much larger proportion of nitrogen and nitrogenous elements than any other crop. It is a fact which a great many observing farmers in England and this country have noticed, that, after a crop of clover, a grain-crop will grow better than it will after any other crop. The question was asked, Why is it? and how does it happen? Professor Voelcker, one of the best authorities in the world on agricultural chemistry, took pains to investigate very carefully and thoroughly in order to be able to answer that question. He arrived at these conclusions:—

1. That a good crop of clover removes from the soil more potash, more phosphoric acid, more lime, and other mineral matters which enter into the composition of the ashes of our cultivated crops, than any other crop usually grown in the country.

2. There is fully three times as much nitrogen in a crop of clover as in the average produce of the grain and straw of wheat per acre.

3. Notwithstanding the large amount of nitrogenous matter, and of the ash constituents of plants in the produce of an acre, clover is an excellent preparatory crop for wheat.

4. During the growth of clover a large amount of nitrogenous matter accumulates in the soil.

5. This accumulation, which is greatest in the surface-soil, is due to decaying leaves dropped during the growth of clover, and to an abundance of roots, containing, when dry, from one and three-quarters to two per cent of nitrogen.

6. The clover-roots are stronger and more numerous, and more leaves fall on the ground, when clover is grown for seed than when it is mown for hay. In consequence, more nitrogen is left after clover-seed than after hay, which accounts for wheat yielding a better crop after clover-seed than after hay.

You see that is a most important consideration; for if you can get a good crop of clover, and have your ground left in better condition than before for wheat, or any other grain-crop, that is so much clear gain, is it not?

7. The development of roots being checked when the produce in a green condition is fed off by sheep, in all probability leaves still less nitrogenous matter in the soil than when clover is allowed to get riper, and is mown for hay. Notwithstanding the return of the produce in the sheep-excrements, wheat is generally stronger, and yields better, after clover mown for hay than when the clover is fed off green by sheep.

Notwithstanding all the excrements which are left by feeding clover green by sheep, the soil is decidedly better for a wheat-crop, if the clover is allowed to go to seed, than it would be if the clover were cropped green by any number of sheep. That is an important fact.

8. The nitrogenous matters in the clover-remains on their gradual decay are finally transformed into nitrates, thus affording a continuous source of food, on which cereal crops specially delight to grow.

There is another important consideration: that is, you apply the Stockbridge Fertilizer, nitrate of soda, or any other form of nitrate, in the spring, as most farmers would apply a special fertilizer, and all that you may apply is not so valuable for a grass-crop or for a grain-crop as the nitrogen which is left after a crop of clover, either cut for hay or ripened for seed.

The amount of nitrogen left by a crop of clover in the soil was carefully investigated by Professor Voelcker, and he found that it was from two and a half to three tons per acre. He found, that, on soils where clover had been grown, not only is all that nitrogen collected and stored up in the soil by the clover, but it is left, when spring arrives, in a vastly better condition to take and carry on a grain-crop than any fertilizer which can be applied in the spring, — a most important consideration.

These investigations were made at different depths of soil; in the first place an upper layer of six inches, then the next six inches below that, then six inches below that. Eighteen inches of soil were carefully collected and analyzed by Professor Voelcker with great care.

Now, I know of no better or more economical way of obtaining and supplying nitrogen to the soil than that. It seems to me important that farmers should realize that clover is not only a very important crop of itself to raise, but that it vastly improves their land. Bear in mind that this nitrogen, when it is left by your crop one season, is changed into nitrates, — nitrate of ammonia, nitrate of potash, and other forms of nitrate, — which are available immediately, when spring opens, for the use of your crops. You may apply a fertilizer in the spring, and, if the rains come on, very well; but, supposing you have a drought, what are you going to do then? A dry spring is very hard upon special fertilizers. But the nitrogen left in the soil by a clover-crop is changed, during the decay of the roots of the clover and the organic matter of the decaying leaves, into the form of nitrate, which is just the form available for the use of your plants.

Allow me to say a word in regard to the alsike, or Swedish clover. I had great hopes, when the alsike was introduced, some ten or fifteen years ago, that it was to be a very great acquisition. I took pains to experiment with it, and sowed it with red clover and with mixtures of grass-seeds, on different soils, and continued to study it with considerable care. The seed was higher than red clover at that time; and it discouraged a great many farmers from using it; but it is lower now. A pound of alsike clover contains a vastly greater number of seeds than a pound of red clover; and that ought to reconcile us to paying more for the seed than we pay for

red clover seed. It is not so valuable as a fertilizing crop as red clover: its root and its mode of growth are different. The alsike is a perennial, like red clover. Both are short-lived perennials. You can keep red clover three or four years, and the alsike four or five years, on good soils. If you sow it on a dry and exposed knoll, and allow your cattle to feed it too close, you will not see any thing of it the next year; but, when it is sown on soil fairly well suited to it, I think you can depend upon a good return from the alsike for four or five years at least. It is more like our white clover than red clover in its growth and blossom, and must be regarded as one of the valuable additions to our forage crops. I should not want to seed down with orchard-grass, meadow-fescue, and other early grasses and red clover, without putting in some of the alsike also. If I were going to sow red clover alone, I should sow twelve or fifteen pounds of seed; but I should prefer to have eight or ten pounds of red clover and five pounds of alsike, than to have fifteen pounds of red clover. It is rather finer, rather more slender in its mode of growth; but it is very sweet and nutritious, and the cattle like it very much.

The orchard-grass has many good qualities, both as a grass to cut for hay and as a pasture-grass. It is rather coarse, if sown thin. It must be cut early, or you lose a great deal of its value. It will usually blossom about the middle of June, and ought to be cut at that time. Some complain that it does not hold in the soil as well as some other grasses; but this depends upon the quality of the land, and whether it is well adapted to it or not. It has the quality of starting earlier, after being cut or grazed off by cattle, than most of our other grasses. It is apt to grow in clusters; but this can be avoided, to a very great extent, by good cultivation of the land, and by sowing it thickly. It requires to be sown thickly, — two or three bushels of seed to the acre, if sown alone; but a liberal mixture of other species will give a better result. The meadow-fescue is a common grass with us; and the seed can now be got in our markets at a very reasonable price, as can all of the other grasses to which I have referred. At the time when my Fourth Report was made, it was not possible to get, in our markets, a great many of the species to which I alluded; but I am very glad to say that the best

seedsmen in Boston are now well provided with most of these different seeds, which they sell at reasonable prices; and the farmer need not hesitate, therefore, to provide himself with this larger number of species on the ground that the seed is

Orchard-Grass.

Meadow-Fescue.

extravagantly high. You can buy meadow-fescue at thirty cents a quart; you can buy perennial rye-grass at fifteen cents a quart. It is lower than Timothy, red-top, or orchard-grass; and the tall oat-grass is quoted at about twenty cents a quart.

The June grass as it is commonly called with us, or Kentucky blue grass as it is called at the West, must be regarded as one of the best pasture grasses known. It is common all over the northern part of the country, growing indigenously

June Grass.

Tall Fescue.

in all limestone countries lying between the thirty-fourth and the forty-fifth parallels, and coming to its highest perfection upon the rich, marly blue limestone soils of some of the central counties of Kentucky. It is said to have been found

growing there when the region was first discovered, constituting a natural pasturage that attracted vast numbers of grazing wild animals, countless herds of buffalo, elk, deer, antelopes, &c.

Perennial Rye-Grass.

Italian Rye-Grass.

This grass is not so well adapted to a short rotation, and is, therefore, less suited to our mowing-lots, from the fact that it requires three or four years to become well set so as to form a close sward. This habit of growth is less objectionable as

a permanent pasture. When a soil is once well sodded with this grass, it will endure the vicissitudes of the seasons — heat and cold, sunshine and shade, droughts and floods — with wonderful persistency. It is the source of wealth in sections adapted to it, and there are pastures of it fifty years of age still luxuriant and profitable. It throws up flower-stalks but once in the season, but it starts quickly after grazing, and forms a thick green growth.

Of the late grasses, there is no better, on the whole, for land that is adapted to it, than Timothy; but if it is allowed to stand too long, as every farmer knows, it becomes hard and woody. I think we have made a mistake in allowing it to stand too long. I know very well that we cut earlier now than we did twenty years ago: we have gained, on the average, fully a fortnight over and above what was the universal practice and custom twenty years ago, and perhaps a little more than that. But where the whole farm, or the larger part of the area of the farm, is stocked with these late grasses, if you wait until the Timothy and red-top are in blossom, before you get through, a considerable part of the grasses will have become too old. The sweet juices of the grasses — the sugar, gum, and other elements which add to their nutritious qualities — rapidly change in the process of ripening after the blossom is formed; or rather these elements are stored up in the seed. Unless they are cut at the proper time, the grasses very soon become hard, woody, and comparatively indigestible.

In seeding down land for pasture, the object is to have a continuous growth throughout the season. Early and late grasses are wanted; and the largest number of varieties will, other things being equal, give the best results. There is no objection to the use of any kind of grass-seed; and, with the greatest variety, the prospect of getting a close and firm-set turf is greatly increased. The English farmers are ahead of us in this respect. They seek and use all the varieties they can find, apparently, and take infinite pains to secure the best results. In order to learn of the best and most recent improvements in their practice in seeding down for pasture, a circular was sent, not long ago, to the best grass-growers in different parts of the kingdom, to ascertain their opinions; and the following mixtures are some of their returns.

A return from Durham — soil a loam, portions of it light, with some clay — gives as the mixture for permanent pasture per acre: —

3 pks. perennial rye-grass.
13 lbs. white clover.
10 " trefoil.
4 " alsike.
6 " cow-grass.
3 " red clover.
1 " crested dog's-tail.
1 " cock's-foot (orchard-grass).
1 " sweet-scented vernal.
1 " meadow foxtail.
1 " hard fescue.
1 " smooth-stalked meadow-grass (June grass).

In Cheshire the following mixture is used per acre: —

$\frac{1}{2}$ bush. cock's-foot (orchard-grass).
$\frac{1}{2}$ " meadow foxtail.
$\frac{1}{3}$ " perennial rye-grass.
$\frac{3}{4}$ " meadow-fescue.
$2\frac{1}{2}$ lbs. sweet vernal.
4 " June grass.
3 " white clover.
2 " trefoil.
2 " Timothy.
$1\frac{1}{2}$ " cow-grass.

The practice on the estates of the Earl of Powis, on stiff soils, is to sow —

4 lbs. crested dog's-tail.
1 " sweet vernal.
3 " cock's-foot.
4 " tall fescue.
4 " meadow-fescue.
3 " rough-stalked meadow
2 " meadow foxtail.
4 " Timothy.
2 " alsike clover.
2 " white clover.
6 " perennial rye-grass.
5 " Italian rye-grass.

These mixtures are given as examples of what may be called the best practice among English farmers; and they show that much better selections are made than is common with us.

As to the time of sowing grass-seed, a very considerable change has taken place in the general practice in the last quarter of a century; and, upon the whole, there has, undoubtedly, been a very great improvement arising from it. Within the memory of many still living, the practice of spring sowing was almost universal. It resulted in far greater losses than we usually sustain now. For though there is, perhaps, no season when it can be absolutely safe from harm, we know enough of the seasons to know, that, in a series of years, we are more liable to injury from drought than from winter-killing. One year differs from another to such an extent, that we run some risk, at whatever season the sowing takes place. If any time can be called the best, we should say, *as a general rule*, it is from the middle of August to the middle of September; the exact time depending somewhat upon the moisture in the soil. If the month of August were excessively dry, we should wait till early in September; but if we could not sow, for any reason, till after the middle of September, we should prefer to wait till the middle of November, or just before the ground closes for the winter. In a large majority of cases, this late sowing will be successful, as the seed will not germinate so as to be injured by the winter, and will start earlier in spring than it would be possible to work the land properly to sow it in the spring.

Still there are many cases, where, from the natural moisture of the land, or for some other reason, it is more convenient to sow in the spring. In such cases, to insure success, the land must be liberally manured (unless it is naturally very rich) in order to give the seed a rapid start and a luxuriant growth, or the weeds will come in, and choke out the grass, and do great injury, if they do not absolutely destroy the crop. It is not safe, as a general rule, to sow in the spring without this manuring. Without it, the young plants will start, and grow too slowly to keep down the weeds, and to fill up so as to shade the ground, and withstand the dry and hot weather. A close, thick growth that results from liberal

dressing will secure greater benefit from the dews, even in a dry time; and they will often bridge over the drought, and prevent entire destruction.

It is of no use to deny that grass-seed will often do well, sometimes exceedingly well, when sown in the spring, under favorable circumstances as to soil and moisture. My point is, that, under equally favorable conditions, it will usually do better when sown in the fall, especially if sown early enough to allow the roots to form and gain a strong hold in the soil, and to send up shoots or stalks sufficient to furnish a covering and protection from the frosts of winter. With this covering or protection, either of its own growth, which acts like a mat, or a top-dressing, it will start earlier and more vigorously in spring, and yield a larger crop, than it could be expected to do without it.

If the sowing takes place any time in August, it is generally safe to sow the clover at the same time, as there will be time enough for it to get firmly rooted so as to stand the winter; but, if later than that, it is better to delay sowing the clover-seed till late in March, or even till early in April, when, if the surface is dry enough to admit of it, rolling is a useful addition, as it presses the seed in, and gives it a little earlier start. Rolling also will press the earth firmly around the roots of the young grass-plants, and remedy any injury they may have received from the frosts. And here comes in the use of a simple, home-made contrivance, called a "drag," as described by Mr. Ware in my last Annual Report, to which I would call attention as an excellent substitute for the roller, that will far more than repay the cost.

I do not believe it is good policy to sow grass-seed with any grain-crop. I know the practice, in some cases, is to sow grass-seed with oats, or with rye, or with barley. Barley is much better than oats or rye. If I were going to sow grass-seed with any grain-crop, I should much prefer barley. But I believe that is one of the ways in which we are robbing our grass-land, for the sake of getting a grain-crop. We want to save the fertility and strength of the soil for our grasses, and we want to turn our attention to the building-up and perfection of our grass-lands rather than our cultivated lands. If you take a crop of grain from your grass-land, you are injuring the grass to a certain extent. It may not kill it

entirely; but it stands to reason that it must injure it much more seriously than is generally supposed. If you sow your grass-seed with oats in the spring, and cut your oats, say in July, or whenever they are fit to cut, and there happens to be a hot and exceptionally dry time, the chances are about even that your grass will be entirely destroyed. Here and there will be a moist piece of land that will stand that kind of treatment; but it is an exception. If grass-seed is sown in the spring, I would rather take my chance with the grass alone than with any grain sown with it. In nine cases out of ten I should get the advantage of it. Here and there may be exceptions (there are exceptions to almost all general rules, of course); but we must act on general rules. In a great many matters in reference to farming we are to take our chances, and consider how, on the whole, we shall be most likely to get the best results.

The selection of seed should be made with greater care than is usually exercised, both with reference to the freshness or purity of seed and the species to cultivate. There is every reason to believe that large quantities of old seed are left over from year to year to be mixed in with new seed as it is received from first hands, and that farmers sustain great losses in consequence of this practice. It is not easy to detect this mixture. It is not necessarily fraudulent, though the result to the farmer is often as bad as if it were. The length of time which seeds retain their vitality differs considerably. The seeds of some plants retain their vitality longer than others. Seeds so small as those of the grasses are generally comparatively short-lived. But it does not necessarily follow, that, because seed is left over one year, it has lost its vitality. I think, if it were not more than two or three years old, it would be safe to use it. But, after all, you want to know what you are buying.

I know of no way to determine the vitality of seed, except by selecting a certain number, and testing them, by putting them in conditions favorable to germination; which is a very simple thing to do. If you find, for example, that seventy-five or eighty out of a hundred seeds germinate, then you may infer that seventy-five or eighty per cent of that seed is good. If you select at random one hundred seeds out of a lot, no matter what the seed is, and test that hundred care-

fully, and find that fifty, sixty, eighty, or ninety of those seeds germinate, it is reasonable to infer that fifty, sixty, eighty, or ninety per cent of the seed is good, and that the balance is not. That is a very easy matter, but it requires some care; and farmers generally will not take the pains. I would, as a general rule, save a sample of the seed I had sown; and then, if there were any difficulty, I could investigate, and find out where the blame really was. It does not always follow, by any means, that, because seeds do not germinate, it is the seller's fault. The merchant may take infinite pains with his seed, be cautious when he buys, and of whom he buys; and yet the seed may not germinate well, because the farmer has not sown it properly. Seeds so small as those of the grasses must be covered very slightly. If buried too deep, they will fail to germinate; and if, as was the almost universal practice a few years ago, they are harrowed in with a tooth-harrow, a very considerable portion of the grass-seeds are buried too deeply, and will not germinate. In that case, it is the farmer's fault.

To avoid that difficulty, in sowing grass-seeds, instead of using a common iron-toothed harrow, I believe it would be a great deal safer to use a common brush-harrow; but a simple wooden drag is one of the best things that I have ever used. It is cheap, and easily made. Here is a little model that Mr. Ware had last year at Worcester. The one I used six or seven years ago was like this, except that it had not that cleat on the bottom. I think that would be an improvement. This is very much like a common drag, or "stone-boat" as it is often called; only the front bevels up so as to avoid the little bunches that make uneven and bad work. It is eight feet long, made of common plank, and is three feet and a half wide, with this inclined portion about a foot wide. The one I made was, perhaps, a foot and a half longer, and bevelled up a little more than that. I always used that when sowing grass-seed. It was the next best thing to an expensive roller. A good many farmers cannot afford to buy a first-class roller; and this was made to avoid that expense, and see if something could not be devised which should be equally good, and which any farmer could make himself. It is useful for many other purposes, and vastly better than a toothed harrow. It is sometimes advisable to go over the ground

with a brush-harrow, and then follow it with the drag; and, if the surface is a little rough, it is easy to load it with stone or any thing else, and it will leave the surface as smooth as if done by a roller. It is wonderful, if the land is mellow and well cultivated, what a smooth and beautiful surface you will get with this common drag. Mr. Ware puts a little cleat on the bottom, one inch by three inches. He claims that the advantage of this is, that it fills up the depressions made by the horse's feet in travelling over the mellow surface of the land; and I think it would have that effect.

I would like to say a word, before closing, in regard to the time of cutting our grasses. As I stated before, we have now adopted the practice pretty generally, over the State, of cutting our grasses at least two weeks earlier than was the custom twenty or twenty-five years ago. I think we have gained that much, although it is possible that grass may be cut too early. The time to cut grass, every one will admit, is *when it contains the most nourishment.* No doubt about that. When is that point? What is it that nourishes the animal? It is certainly *not* woody fibre. That may serve to give bulk; and, if you add sufficient concentrated food in the shape of meal or grain of some kind, an animal may get along on over-ripe and over-dried hay. But, if you judge from the taste and instinct of the animal, you cannot resist the conclusion that early-cut hay, *or dried grass*, is far more palatable, more to the taste, than late-cut; and, if that is taken as any sure guide, we must conclude that the early-cut grass has a larger proportion of soluble, nutritive constituents than grass after it has been allowed to form seed. Now, if you observe the grasses in pastures, you see that cattle invariably leave such as run up and form flower-stalks, and choose the low, tender, leafy plants, the most succulent, juicy; and we must conclude that such grasses are sweeter, contain more sugar, starch, and other elements that suit the taste and go most readily to nourish the system, because more soluble. I don't see how we can resist the conclusion that the tender, immature grass-blade, with its young, fresh leaves, is more nourishing than the flower-stalk, even with its seed formed, and well advanced toward maturity. You may find the same elements in the green grass that you will afterwards find in the ripened seed. They leave the young blade,

and go into the seed and grain as it approaches maturity. In the green state they may be more diluted, more watery; but their cells, the structure of the plant itself, are less woody, and more digestible. A material that is indigestible, that must pass bodily through the animal, cannot furnish much nourishment; and animal nourishment is the main thing that we are after. That is just what we cut and cure hay for.

We have taken a very great step in advance in adopting the practice of cutting our grass earlier than formerly. It was customary, a few years ago, to begin haying the day after the 4th of July, if the farmer and his hired men felt like working then: if not, it might be begun a day or two after that. But now, take the State over, I think the practice is to begin not very far from the middle of June. Of course seasons differ somewhat, and the farmer may make a mistake sometimes. We are obliged to fall back upon our judgment and common sense in the last resort; for we must take our chances; and, as the seasons go, I think it is better, on the whole, to begin haying early, if it is practicable to do so. Many farmers object to it, because they think they must get through with their hoeing in the first place; and that is certainly a matter to be considered. But it ought to be borne in mind, that, with our present facilities for securing this important crop, — with our mowing-machines, horse-rakes, and hay-tedders, — we can handle the grass-crop infinitely better than we could twenty years ago; so that we are not necessarily driven so much in haying as we were then. I remember the time when we began about the 5th or 6th of July with the scythe; and nothing else could be touched until August, and sometimes later than that. Now, with our advantages in handling the hay-crop, we can carry on the hoeing to a reasonable extent in connection with the haying. I think that is a practice which ought to be generally adopted. We can keep along the hoeing, and not let the weeds get ahead of us.

Now, with regard to our arable land and the grass that is cut in the regular rotation of crops, there can be no doubt that we have made great improvement in the last twenty years, though not so great, perhaps, as we ought to have made in that time. But how is it with the management of our permanent pastures? Here improved management must

be regarded as the exception rather than the rule; and yet I do not hesitate to say, that, in my opinion, money judiciously laid out in improving permanent grass-land will make a better return than money laid out on our arable land that is kept under rotation.

The production of meat, to be sure, is not the specialty of this State, and it probably never will be; but it is one of the important incidents to every well-managed stock or dairy farm; and economy of production both of meat and milk involves the improvement of pasture-lands to an extent which will enable them to meet the demand made upon them for a greatly increased supply.

Our pasture-soils differ greatly in quality. Many of them are rocky, thin, and ill adapted to grass naturally; but with most of them there is hope of improvement, except in sections where they consist of light sand or gravel. To try to improve a pasture of light sand is about as hopeless and ceaseless an operation as we can ever undertake, unless we can prepare a compost of strong, stiff loam, road-scrapings, &c., to correct the natural deficiencies of the soil.

Stronger soils are more promising; and, as a general rule, it is wiser to leave the stronger soils in grass, and to use the lighter for the plough and for tillage.

It is to be regretted that sheep-husbandry has come into such disrepute in this State. I believe it would be for our interest to resort to it to improve our pastures, if for nothing else. I had an old pasture, eight or ten years ago, which had been worn out by being fed by dairy cows time out of mind. Bushes and briers had come in; huckleberry-bushes, alders, mosses, and every sort of botanical specimen, abundant enough to delight the heart of a botanist. It was one of the worst pastures, in that respect, that I ever saw. It was so rough and rocky, that I could not get a plough through it; and the question was what should be done with it. There were about thirteen acres in this piece. I cut the bushes, and put in more than a hundred sheep,—a great many more than the pasture could possibly carry. I did not expect them to live on bushes, and knew they would not if I did. It was necessary to give them something to keep them quiet and contented, or they would be jumping over the stone wall. So I bought a lot of cotton-seed-meal, paying thirty-five or

forty dollars a ton; and I fed those sheep every day, morning and night, with cotton-seed meal. They liked it first-rate, and it agreed with them uncommonly well. I do not remember the exact quantity, but perhaps a pint for each sheep at each feeding; and the moment I went into the pasture they would run to get their breakfast or their supper. The result was, they cleaned out absolutely every brier, and every sumac-bush, and many other shrubs, but not the huckleberries. I could not induce them to eat the huckleberry-bushes. They covered the pasture with manure. It was a delight to see the dressing they gave it. They went through the following winter in good store condition; and the next spring I put on twenty or thirty less, and they went along the second year, and did very well. My original plan was to run them three years on that pasture; and I believe it would have been entirely changed in its character at the end of that time, judging by the improvement that had been made.

The cotton-seed-meal was a great advantage to that pasture.

Cotton-seed makes about the best manure, according to the chemists, of any feeding-substance you can get. But the point I wanted to suggest is this, that we can do something by feeding our cattle while at pasture, either with linseed-meal, cotton-seed-meal, shorts, middlings, or something of that sort, by which they will be adding largely to the permanent improvement of the pasture. I believe that the method of improving rough pastures by sheep is, on the whole, one of the best and most economical methods. But if that is impracticable, if the farmer finds that he cannot take care of the sheep, or is afraid of dogs, the next best way is to feed the cattle with some extra feeding-substance, and keep them as much upon the pasture as possible; and if it is necessary to get the cows up into the yard every night, so that the pasture loses a considerable portion of the manure, then I would return some reasonable portion of it as a top-dressing, in the form of compost; or else I would select some concentrated fertilizer. Superphosphate and ground bone make a good dressing, if they can be obtained at a reasonable price. The point is, that money spent in improving our grass-land is more judiciously and wisely spent than it is in putting it all into our ploughed lands.

Nothing is better settled than that the grass-crop needs a variety of plant-food to enable it to reach a perfect development. A mixed top-dressing, consisting of nitrogen, phosphoric acid, and potash, is a far more economical application than any one substance, unless it be good farmyard-manure, which contains all these ingredients in reasonably suitable proportions. A compost of these essential constituents is now easily obtained. The nitrogen is cheaply obtained in the form of nitrate of soda or Chili saltpetre, guano or muriate of ammonia; the phosphoric acid in bones or pure bone-meal; the potash from pure ashes, or more readily from kainit, or some high grade of the German potash salts. These three indispensable ingredients are used, I believe, in Professor Stockbridge's formula for grass.

There is probably no man whose opinion is worth more on questions relating to scientific or progressive agriculture than Mr. Lawes, whose elaborate experiments at Rothamsted, in England, are well known to every intelligent farmer. He was recently applied to by a gentleman who had a lot of old run-out pasture-land that sadly needed renovation, to know what he should use; and his reply was, Put 1¼ cwt. of nitrate of soda, 2½ cwt. of superphosphate, and 3 cwt. of kainit per acre. How those proportions differ from the Stockbridge Fertilizer for grass, I will not undertake to say; but the leading constituents of the compost are essentially the same, and they constitute a most excellent mixture.

To make the most of our pastures, we ought, I think, to resort to a more extended use of artificial fertilizers, taking greater care to see that they are what they are represented to be, and to supplement the pasture-feed with extra feeding of cattle while at grass, either in the shape of linseed or cotton-seed meal, or, what is about as good, perhaps, Indian meal or middlings. By this artificial aid we are enabled to carry more stock, and to keep the pasture constantly improving, instead of running down.

The mistake has often been made by those who were ambitious to do something for their pastures and other grass-lands, — something, perhaps, out of the common run of farm practice, — of applying only one substance. A farmer thinks, from all he can learn, that his pasture wants phosphates; and he makes up his mind that ground bone or bone-meal is just the thing.

He puts on a good dressing of that, and waits to see the result. He is disappointed. The grass is a little improved in quality, but he cannot see that he has got his money back; and he makes up his mind forthwith, that ground bone does but little good on his land.

Or perhaps he thought that ammonia, or some nitrogenous stimulant, was just what his grass-land needed; and he applies guano, or nitrate of soda, or some form of muriate or sulphate of ammonia. He finds his grass takes on a deep green color, and shows signs of a vigorous growth. He begins to think he has hit the mark this time; but he soon finds that his cattle do not relish it as well as grass that has been grown under less stimulus. He notices that grass with such a growth is not so healthful and nourishing as he expected it would be, and that it soon assumes a sickly appearance. He makes up his mind that too much stimulating manure in too soluble a form acts on grass very much as an unnecessary stimulus does on men, giving a high color and increased vitality, with a tendency to premature decay. In fact, the grass will suffer from such treatment sooner or later, just as a man who lives in this unnatural way.

Nothing is more certain than that a moist climate is indispensable for a rapid and luxuriant growth of grass, or that it is impossible to contend, except under great disadvantages, against the adverse influences of climate. Our climate is not favorable to the highest uniform success in grass-farming. We have rainfall enough, taking the year through, as a general rule; but the trouble is a want of a sufficiently uniform distribution of rains. We are liable to droughts almost every summer. Sometimes they occur early in the season, and then they are well-nigh fatal to the best growth of grass. Sometimes they occur later, and then they cut off or greatly reduce our fall feed, and interfere sadly with our plans for laying down to grass, compelling us to resort more or less every year to various shifts and expedients to overcome the natural obstacles against which we have to contend. On the other hand, we cannot change or very materially modify our climatical conditions. We are compelled to take them as we find them, and to make the best of them.

One of the most common expedients to meet the case of a severe drought, and the necessity of extra feed, is the practice

of sowing fodder-corn, to cut up green, and feed to cows and other stock. Within a few years another plant, known as Hungarian grass, has been introduced, and has come to be extensively cultivated. It is a valuable acquisition to our forage-crops, and is probably better for keeping up the flow of milk in a herd of dairy cows than green corn or any other soiling-crop, while it possesses incidental advantages which recommend it for general use.

Some chemists think they have discovered the corner-stone on which all economical feeding rests; and that it consists in the proper mixture of albuminoids and carbo-hydrates. Whether this constitutes the true basis or not, we need not undertake to say. Science is constantly progressive; and some chemist may discover, or think he has discovered, some new elements which may upset all our theories in regard to the nutrition of animals. But, taking this as the latest scientific *dictum* on this point, let us compare this plant which we call *Hungarian grass*, with other well-known feeding-substances, and see if we can derive any information that will be satisfactory.

According to the analysis of Hungarian grass recently furnished me, at my request, by Professor C. A. Goessmann, the State agricultural chemist, the plant in a green state, cut when grown from eighteen to twenty-four inches high, — the condition in which it is usually taken to feed out green, as a forage-crop, — contains 5.86 per cent of albuminoids; while Timothy, cut in a similar condition, or in the form of green grass, contains only 4.86 per cent of the same elements, or just one per cent less, — a difference in favor of the first. Hungarian grass in the same stage of growth contains 11.34 per cent of woody fibre, a comparatively indigestible material; while Timothy contains 11.32 per cent, or two-hundredths of one per cent less, — an exceedingly slight difference in favor of the Timothy. In respect to fatty and nitrogenous elements, Hungarian grass contains 14.95 per cent, while Timothy contains 24.35 per cent, — a difference in favor of Timothy, so far as the nitrogenous extracts are concerned,

If, now, we take the hay made from Hungarian grass, and compare it with that made from Timothy, we find, that, in the former, there are 9.37 per cent of albuminoids, in the latter 11.36, and in June or Kentucky blue-grass hay, 10.35, show-

ing these hays to be better in this respect. Of fat-forming constituents, Hungarian hay has 2.23 per cent; Timothy, 3.55 per cent; and June grass, 2.63 per cent. Of nitrogenous extracts, Hungarian has 38.41 per cent; Timothy, 53.35. Of raw or woody fibre, Hungarian contains 31.55 per cent; Timothy, 26.41; and June grass, 38.02. I do not think we can place implicit confidence in these results, as the investigations were made by different chemists on plants grown under somewhat different conditions; but they indicate, that, in the form of hay, both Timothy and June grass are considerably superior in nutritive qualities to Hungarian, — a result which might have been expected.

But Hungarian has steadily and rapidly gained in popular favor, till the seed is now sold in Boston to the extent of nearly seven thousand bushels a year. One small house sold seven hundred bushels this season, another about two thousand, and so on. That is a good indication of the estimation in which it is held among farmers.

QUESTION. Cannot a pasture be harrowed with a fine-tooth harrow, and clover-seed sown with advantage?

Mr. FLINT. Where a pasture is bound out and mossy, and the grass-roots unhealthy, which is the case with many of our pastures, it might not be impracticable to improve it by tillage. In such a case it occurs to me that it would be well to run a Shares harrow over it diagonally, first in one direction, and then the other, cutting it up into little squares of about an inch, which would loosen the soil, and then sow pasture grass-seeds, with a little white clover, or alsike clover, and give it a light top-dressing. I think that is perfectly practicable, and that it would make a permanent improvement in our pastures. But red clover is too short-lived to serve as a pasture-grass.

Mr. WARD. It is supposed that our soils are exhausted. I am happy to say, what I know to be true, that a clover-crop will take out more nitrogen from the soil than any crop that you grow. That being the case, it shows that our soils here in New England, that we have supposed were exhausted, still retain their pristine fertility. It only needs that we put the soil in such a condition that the insoluble elements that exist there can be extracted, in order to enable us to grow

any crop without any fertilizers. A clover-crop takes from the subsoil, and drags to the surface the elements required by those plants which do not extend their roots so deep. In my opinion, those old, exhausted pastures, which are so important to the dairy interests in particular, and which we desire to bring into fertility to give sustenance to our cattle, can be greatly improved by drawing over them a fine-toothed harrow similar to the Thomas smoothing-harrow, setting the teeth at such an angle that they will scratch the surface, then sowing a little clover-seed, and putting on one or two hundred pounds of plaster to the acre. In this way, without any manure, and with very little expense for seed or plaster, you will secure a good pasture for your stock, and at the same time you bring from the subsoil to the surface the elements that will continue to improve your pasture from year to year; and when, finally, you desire to break that pasture up for tillage purposes, you have your soil in a condition to grow almost any crop. That has been my experience, and that is the cheapest and best way I know to fertilize our pastures.

In regard to the quantity of seed to be sown, I would merely mention that red clover contains 205,000 seeds to a pound, whereas white clover contains 686,000 (more than three times the number of seeds), while a pound of sweet-vernal grass-seed contains 923,000 seeds. It is as important to have the soil in a condition to grow the grass-seed that you sow as it is to have good seed; and as much fault can be found with the farmers who sow the seed, and complain that they do not get a good catch, as with the dealers in seed. The fault is more frequently with the farmer in not getting the soil into a condition to bear his crop after the seed germinates, than with the man who sells the seed.

It has been said, that, in regard to the time of sowing and the quantity of seed sown, we have got to take the chances. I do not myself consider that the farmer has to take any chances. If he wishes to sow grain and grass-seed together, and to have them both germinate and grow well, he must have his soil in a better condition than if it is to grow grass alone. There is a very great difference in soils. If you plough up some soil, you will find that certain grasses will grow there that are indigenous to it, and you will get a good

crop of grass, while at the same time you may sow other grass-seed in that soil, and scarcely any of it will germinate. The difference is in the character of the grass and in the condition of the soil. Now, as has been well said, if you sow a crop of clover, you bring from the subsoil the nitrogenous substances that you need to improve your land; so that although clover might be considered an exhausting crop, yet the facts of the case show that it is an invigorating crop.

Mr. Smith of Northampton. Mr. Flint spoke of the failure of grass-seeds. I think that here in New England we do not understand one great cause of the failure of grass-seeds. The Timothy that is raised at the West in such large quantities is reaped, bound, and stacked, and, in many instances, remains in the stack for some considerable period. Many times it heats in the stack to such an extent, that the vitality of the seed is destroyed. It does not hurt the looks of the seed, and people buy it just as readily as the best of seed. I saw, but a few weeks ago, large stacks that were cut in 1876. The seed was not threshed out that season, because the price was low; and the farmers let the stacks stand over. I think the seed will be just as good the second or third year as the first, if it can be kept perfectly dry; but a large portion of that which is stacked must be damaged more or less by the rains. When stacked, it cannot be all protected; and if it heats, as it does frequently (being carted when the dew is on, or when it is in a damp condition), it heats enough to injure the seed: hence there are thousands of pounds of seed in the market that never will grow. The only way I can judge whether it has been injured or not is by the color. It looks plump and round as ever; but, if it is pretty brown, I take it for granted that it has been pretty well weather-beaten, or that it has been heated in the mow or stack. Clover-seed I have kept for a number of years. I used to raise and clean clover-seed enough for my own use, and have some for market. I put it away in barrels, in a dry place, and kept it for three or four years; and I never could see any difference in the growth of those seeds as compared with other seeds.

Speaking of oats, and seeding after oats: the greatest trouble I have in spring seeding after oats is, that my land is too good. My oats lodge, so that they kill out one-half

of the grass, at least. Latterly I have adopted the plan of turning my stubble over immediately after harvest, put on some kind of fertilizer if I choose, and sow my grass-seed, and I usually have good luck. Last year I had exceedingly bad luck. The drought killed it, and I had to go over it two or three times before I could get a good catch.

Mr. WHITTAKER of Needham. If all things were equal in agriculture, then it could be carried on with a square rule, and each one could take home what is said here, and apply it with success in his own farming-operations. But agriculture is one of the most unequal things known, for you can scarcely find four square feet of land that are exactly the same as the next four square feet adjoining them: consequently, whatever general principles we may learn at these meetings, when we take them away from here, we must modify them according to the circumstances in which they are to be applied, or we shall have to bear failures. Probably that is one of the reasons why there is such an apparent disagreement in the operations and in the results of individual farmers.

One gentleman has spoken of replenishing his pasture by going over it with a fine-tooth harrow. I had a piece of land from which I had cleared off the wood, and burned it over; and I wanted to make it into a pasture just as cheaply as possible. There was a considerable amount of ashes after the brush had been burned, and I conceived the idea of going over it with a pretty heavy harrow. I put on two horses, and that harrow worked as though it were full of springs. Sometimes it went three feet, sometimes six. I saw it made but very little impression on the soil. I have had my hands worse scratched by my old cat than that harrow scratched the soil, and I did the best I could with it. I put on clover and grass seeds, all I could think of; but I tell you I could count the seeds when they came up, if I couldn't count them when I put them in.

I have been greatly interested in raising sheep. I do not care much about the mutton; for no man would ever think of feeding sheep on bushes, to make mutton that any civilized man wants to eat. But there was a good deal in that idea of feeding sheep on cotton-seed-meal; and there was a good deal in the idea of putting sheep in pastures to destroy

the bushes. Those bushes are full of materials which the grass-seed wants; and sheep will eat them, and void them, and leave them there in a condition for plants to feed upon. They leave a great amount of potash, and that they get from the bushes. I could not put sheep on this pasture I have spoken of; and so I tried another plan. A person owed me some money, and told me if I would take some pigs that he had, at three dollars apiece, he would settle the amount. I had all the pigs I wanted, with meal and pork at the prices they were. But I did not want to lose the money; and, rather than lose it in a bad debt, I thought I would take the pigs, and lose it in feeding them, if I could only get the manure out of them, and have them do some business on that pasture. I put them in pens ten feet square, three in a pen, and set them at work cultivating that ground. I fed them on corn and shorts; and, after they had worked over the whole field, I sowed clover and grass seed, and scratched it in with a rake. I put in all the grass-seeds I could think of, and got a tolerably good catch. So far as it has gone, the pasture has been improved. The next question is, whether I have got paid for doing it, taking into consideration the cost of the pigs, the expense of feeding them, and my time. I reckon I have; for you know that farmers have a good deal of time that they had better spend in such work than loafing around the blacksmith-shop or the country store. I found that was a success, anyway, as far as it went, and it was the only way I could manage this pasture. I do not plough my pastures: I cannot do it.

I bought a place out in Needham; and, when I bought it, I could scarcely keep two cows, to say nothing about horses. If I kept a horse, I had to buy hay and grain for him. I have had the place about nine years; and now I keep ten cows, two yearlings, and a horse. There was one piece of land that I think anybody would have said was worn out. There was nothing on it but moss, hardhack, and a few stunted pines. I went to work and ploughed a part of it up, manured it well, and put in fodder-corn. With all due deference to Dr. Loring, I must say that that corn was a success; and my cows said it was, and they gave plenty of milk. The fall following I sowed winter rye, and in the spring I had a good catch of that. Remember, that, before I put in my rye, I put in

manure. I never plough a piece of land without putting manure on top, and harrowing it in; then, if I sow grain, I harrow it in; if grass-seed, I brush it. My way is to put fodder-corn into this old land, then fall rye or spring rye. I get that off the first of July, and then put in a crop of Hungarian grass, and cut in September, about a ton and a half to the acre; the spring following, I follow that with barley, and sometimes clover, and sometimes grass-seed.

I tried the experiment, this spring, of sowing clover, orchard-grass, July oat-grass, and perennial rye-grass; and I had an excellent catch, although I sowed the grass-seed with barley. But remember that I put my manure in. I can't say how successful I am going to be with it, until another year. But, if I put in barley, I will tell you another thing I do. I do not believe in putting in a reasonable amount of manure when I first seed down, and allow the grass to grow until it has about died out, and then try to bring it up. I believe in giving the land manure, as you would give milk to a calf, if you wanted to bring it up,—give it early. If we take off crops, we must put something back to feed the crops. The idea goes from one to another, that this thing and that thing is an exhauster of the soil. Let me tell you that you cannot have phosphate of lime and nitrogen in your barn and in your crops at the same time. Whatever we put into our ground, we put in for the purpose of taking off the crops, and feeding them to our cattle. The one object of agriculture is to feed and clothe and make up men. When it has done that, it has completed its circle, and comes round to build up another generation of men, which, I hope, will be wiser and better than we have been.

I believe in sowing grasses that will bloom about the same time; so that we can get one crop out of the way before we start on the later crop. I think that is an excellent idea, and one that ought to be promulgated. We have had all our grass-fields come in about the same time, and it has been impossible to cut all the grass when it was in its best condition. We have been obliged to cut it either too early or too late; and, of the two evils, I should prefer late cutting. But, if we sow those grasses that blossom and come to perfection in succession, we can commence our haying season about the middle of June, and wind up about the 15th of July; and

that is long enough, in these days, to be bothering with any crop.

I have good success with clover. I have put in clover, and the year following I have got two crops. Sometimes I sow barley with clover, take off my barley green, and let the clover have a fair chance, and get a good crop of rowen. Once in a while I get two crops of clover, and possibly feed it in the fall. The next fall I put in Hungarian grass, which comes off about the first of August; and then I put in Timothy and red-top. I have put in flat turnips, and sometimes have raised, I think, a little too many for the benefit of the soil. The last seed I bought of that kind was last August, and I am sorry to say that a large portion of it was wild turnip. There were a few flat turnip-seed mixed with it, and a few rutabagas. I do not object to the rutabagas; but I do object to the wild turnips.

QUESTION. How much seed do you sow to the acre?

Mr. WHITTAKER. Not less than twelve pounds, and sometimes more. There is one thing that I am a little troubled with. One gentleman said he was troubled by his oats lodging. My trouble is, that my clover grows too large.

Mr. PAUL of Dighton. I wish to put this question to Mr. Flint, Did you say that a crop of clover left two and a half or three tons of nitrogen in the soil to the acre?

Mr. FLINT. Yes, sir; according to Professor Voelcker.

Mr. PAUL. There would be one thousand or twelve hundred dollars' worth of value per acre in a crop of clover. That is the way I understood him; and I made the inquiry to ascertain if I understood correctly.

Mr. FLINT. Yes, sir; that was the result obtained by Professor Voelcker, after a very careful analysis of three six-inch layers of soil. He found from two to three tons of nitrogen and its compounds, and it was to a large extent in a form available for plant-food.

Mr. WETHERELL. I consider the subject that has been discussed this afternoon an important one. I think what the lecturer has said in regard to the early cutting of grass has been assented to by every farmer. He might have said, that, whereas it was formerly the custom to begin haying after the 4th of July, it is now no unusual thing for the farmers of Massachusetts to have done haying at that time. I was told

the other day, that, on the State Farm at Westborough, the haying was not finished until the first of October. The farmer may be a good manager of the boys; but I doubt his ability to conduct a farm of the value and importance of that one. I believe in early cut hay: I believe in preparing it well for the cattle. I do not believe it is possible to get good milk without good feed. I do not think there is any thing cheaper to make milk than corn-fodder. If you can raise as much forage from an acre of corn as you can from an acre of grass, I say raise it, and feed it to your cows.

One word in regard to pastures. I agree fully with what has been said about harrowing pastures and sowing grass-seed; but I want to say that there are thousands of acres in Massachusetts that you could not get a harrow over if you tried. The best way to get over that difficulty is to give up your pastures, and keep your cows in the barn. I can say that the three or four best herds of cows I have seen this summer — and I have seen a good many — are cows that are kept in the barn all the time, except that they are turned out, perhaps an hour or two at mid-day, to take a little air and exercise. I believe, that, where you have arable land, the cultivation of that, and feeding the cows in the stable, is the cheapest way. If any farmer has pastures of the character to which Mr. Flint referred, I think it is better economy for him to let them grow up pines, alders, and birches, and he can cut twenty cords to the acre once in twenty years. I think if our friend here has gone up from two cows to ten by soiling chiefly, he has done a good thing. I think that is a movement in the right direction.

Mr. McGregor. About a mile and a half from here, I own a farm of about twenty-seven acres, that I bought about seven years ago. It was so run down that it took every dollar I could find anywhere, or borrow, or beg, to buy hay and grain to support the animals I put on that farm. There was a place on that farm that I declare to you — and those who know the farm will bear me witness — would not support a grasshopper. Now I cut my two crops of grass yearly from that same land. I commenced on that farm almost in the dark. Although not a young man, I might well be called a young farmer; for seven years is the length of my experience. The first thing I did was to buy some manure. I saw that

the farm was run out, and I went to work to bring it up. It was in the spring; and I put in a crop of barley, thinking I must have something to feed to my cows in the winter, and barley can be raised quicker than any thing else: so I put in barley, and seeded down to grass. I found, when my barley came off, that there was a beautiful crop of grass coming up; but there came a hot sun the next day, and wilted it. It came up during the night; but the next day it went down. As I say, I was a young farmer, and I thought I must learn by experience. I had intelligent farmers around me, and got a good deal of information from them; but, having been born in Scotland, I had a will of my own, and sometimes took my own way, even though I had to pay for the experience. I think the best time to sow grass-seed is in the fall. My experience has been, that I have done a great deal better by sowing in the fall than in the spring. I have had good crops from some of the land there that did not raise any thing but stones when I bought the farm; and the stones were so piled one upon another, that it was said by one of my neighbors, that I must be one of those insane men who come out from the city, stay a few years, and then go back. But seven years have rolled by, and I am still on that farm; and I expect, if I live, to be there seven years longer. Some of my neighbors said it would cost me a thousand dollars an acre to clear some of that land, and I don't know but it has. I did not keep an account of the cost. A great deal of it came out of my arms, and a great deal out of my rising at three o'clock in the morning, and remaining out until seven or eight at night, day after day, week after week. I saw there was no other way but to push and persevere. I said to myself, "Get all the information you can from books and from your neighbors, and then you will not succeed very well unless you put hard work into your farm." Nevertheless, I have to tell you to-day that I have a barn forty feet square; and, before I got done haying, I really thought I should be obliged to build a larger barn. I did make out to get all my hay in; but it was piled clear up to the ridge-pole. I have enough, unless something unforeseen happens, to keep my fifteen cows and three horses without any trouble. To be sure, I grain the year through. I buy my meal and shorts by the car-load. I feed the shorts and the meal for two rea-

sons. The first is, that I think they make the best food to give to my cows to make beef and to make milk; and the other is, that I am very confident that they are very much better than meadow-hay to make manure.

Adjourned to half-past seven o'clock.

Evening Session.

HYBRIDIZATION IN PLANTS.

BY PROF. GEORGE L. GOODALE OF HARVARD UNIVERSITY.

Mr. Chairman, and Gentlemen of the Board of Agriculture, — The subject upon which I have been asked to address you is very closely related to that presented last night by President Chadbourne. Both the topics belong to the department of physiological botany, and they have much in common. My absence last evening not only deprived me of the pleasure of again listening to an honored teacher, but it has embarrassed me by the fear lest I may inadvertently trespass upon some of the ground over which President Chadbourne has so recently guided you.

In the present lecture we are to examine some of the more important facts respecting plant-hybrids and their artificial production. As we set out upon our task, the very first step brings us face to face with a few of the peculiar difficulties with which the subject is surrounded. The more serious of these difficulties consists in the confusion which has arisen among writers respecting the very term with which we are now to deal; namely, the word "hybrid." In a strict and proper sense this word means a cross between distinct species, and it would be well to confine it always to this signification; but the literature of the subject, particularly much of the more popular sort, is crowded with accounts of so-called hybrids which prove to be crosses between varieties, instead of between different species.

A second very grave difficulty, and one upon which that just mentioned largely depends, is found in the wide differences of opinion relative to the limits of particular species.

You need not be reminded that the relations of varieties to species constitute to-day one of the most absorbing subjects in natural history. Although we must not to-night deal with this subject at any great length, it is necessary that we should try to gain a clear notion of what we may call the provisional limits of species. This we will endeavor to accomplish by a few illustrations. Let us begin with the oaks of this State, and recall a few of the facts presented in botanical treatises.

The scarlet-oak[1] and the red-oak[2] are described as two distinct species, which are ordinarily distinguished with ease from other oaks by the form of the cup and the acorn. All the scarlet-oaks resemble one another pretty closely; and the red-oaks agree among each other in certain features of similarity. Now, it has been observed also, that these points of likeness are transmitted from parent to progeny; that from the acorns of the scarlet-oak, scarlet-oaks are produced, from the acorns of the red-oak, red-oaks grow: and from these two facts of similarity, and community of descent, we derive our idea of species. As matter of fact, we have only the likeness to judge from; for of course we have not learned in any one case, by direct observation, whether all the plants of one sort had a common ancestry. We notice next, that, although we admit that the acorns of the scarlet-oak produce scarlet-oaks, there are such wide differences among the descendants, that, in two cases, the varying plants have been regarded as belonging to other species.[3] If we have only a comparison of the different plants to guide us, if it is only a matter of balancing points of likeness against points of difference, the determination of what is a species, and what is a variety of that species, must be a matter of opinion. In the case mentioned, Bartram considered the quercitron-oak a distinct species; Dr. Gray considers it a variety of the scarlet-oak. Michaux the younger regarded the grayish oak a distinct species; Dr. Gray looks upon it as merely a variety of the scarlet-oak. Thus it is seen that there may be a difference of opinion in regard to the range or limits of varieties, in any special case.

We should next observe that there are great differences

[1] Quercus coccinea, Wangenheim. [2] Quercus rubra, L.
[3] Quercus tinctoria, Bartram; and Quercus ambigua, Michaux f.

between varieties. There are many grades of varieties. We take as an illustration a variety of apple. You wish to raise Baldwin apples, and you graft scions of the Baldwin upon any suitable stock. President Chadbourne doubtless told you, that, in the higher plants, there are two chief ways of propagating, — by buds, as in the case mentioned, and by seeds. From the expanding buds of the Baldwin scion you will by and by have flowering branches; and these will bear the desired fruit. But suppose you were to plant the seed of the Baldwin apple, you know you would not obtain any Baldwin apple-trees. You might have some as good, possibly some better, but none just like the parent-plant. The Baldwin is a variety of the species *Pyrus Malus*, the apple; and in this case the variety is perpetuable only by buds, as in grafting and the like, but not by seeds. The traits of the species re-appear in the progeny; but the minor traits which serve to distinguish the variety from the type of the species do not: in other words, the species is preserved, the variety is lost, or is merged in it. Another kindred fact must now be called to your attention. It is generally believed that the many widely different varieties of pea planted for culinary use belong to a single species. These varieties are perpetuable by seed: the traits of the parent appear with very little change in the progeny. Varieties which can thus be propagated with no change, or with very little, are termed races. The finer sorts of our garden-vegetables raised from seed are varieties of this kind, so established that the characteristic traits are transmissible by seed. Thus we see, that, while some varieties can be perpetuated by seed unchanged, others cannot; and I may add that there are between these extremes all possible degrees of permanence in the minor traits. We should remember, when we read any of the treatises upon the subject of hybridization, first, that the distinction between species and varieties is largely a matter of judgment, and that many may recognize as species what others would regard as varieties; second, there are very many degrees in variation; and, third, some varieties may be propagated only by buds, others can be by seeds.

To avoid confusion, I shall, throughout the rest of this lecture, speak of a cross between recognized species as a species-hybrid, between varieties as a variety-hybrid.

We pass next to the consideration of the flower, and the production of seed, recalling to your minds the general structure of a simple blossom. The outer circles of organs in a wild rose or lily, for instance, constitute the envelopes: these are the calyx and corolla, the protective organs; within these are the essential organs, by which alone seed is produced. The inner groups are made up of stamens and pistils. The stamens are the organs which produce pollen, the fertilizing dust. The pistils at their lower part, the ovary, contain the ovules, or minute bodies which are to be fertilized, and which will then become seeds. Without going into details of structure unsuited to this occasion, I wish to impress upon you the important facts, that the cases containing the pollen have a definite period at which they mature; and that they open, in some way, when they are ripe. At some part of the pistil, usually its summit, there is a portion of the surface more viscid than the rest. This is the stigma: upon it the pollen falls, or is carried, and, there adhering, undergoes a change by growth. A minute tube grows from it down to the cavity of the pistil, where the bodies are, which are to become seeds. The period of time which elapses before the ovary is reached is very different in different species, extending from a single day, as in the crocus, to many weeks or months in some orchids. As a result of contact between the pollen-tube and a tiny cell, or vesicle, at the summit of the ovule, impregnation takes place, and a germ or miniature plant is produced. It may be further said, that different plants occupy very different times for the maturing of the seed after impregnation. The ovule ripens into the seed; and the ovary, frequently with some other parts near by, ripens into the fruit.

In many plants the stamens and pistils are in the same blossoms: in others, like Indian corn for instance, the staminate or male flowers are at the summit of the stalk, while the pistillate or female flowers constitute the ears covered with husks; and from the coverings project the slender thread-like styles with the stigmatic surfaces. In such a case as this, the pollen falls from the clusters above, or it is borne by the wind from clusters on other plants. The separation of the sexes is sometimes even greater, the male and female blossoms growing on different plants. There are some plants,

too, like the orchids which have been used to decorate this hall, in which the pollen is transferred only by the agency of insects, in a great number of cases insuring that the ovules of one blossom shall not be impregnated by the pollen of that flower, but by the pollen from some other. The curious mechanisms by which the transfer is effected constitute a very interesting subject, not without its practical bearings on our topic to-night; but we have not time to enter upon its discussion. It is merely necessary to state, in general, that, when a flower is impregnated by its own pollen, it is said to be self-impregnated, or self-fertilized; when it receives pollen from some other blossom of the same species, it is said to be cross-fertilized; if it is impregnated by pollen from some other species, the progeny is a hybrid. We may say, therefore, that cross-fertilization of well-marked varieties of the same species will yield variety-hybrids. Let us keep in mind the practical distinction between variety-hybrids and species-hybrids.

The earliest important work on hybrids was written by Kölreuter in Germany in 1761.[1] In this treatise, and in the appendices printed in 1763, 1764, and 1766, he described his methods and results in artificial hybridization, detailing many thousand cases. In 1849[2] Gärtner published at Stuttgart an account of his observations, covering a period of twenty years or more, and described ten thousand experiments in hybridizing. These great works I know only at second-hand; the former by references in Nägeli's works, and the latter chiefly through Rev. Mr. Berkeley's abstract.[3] Besides these treatises, I may refer you to the important contributions by Andrew Knight, Herbert,[4] Wichura,[5] Lecoq,[6] Naudin, and Burbidge.[7] The literature of this subject is very extensive; for it includes not only special memoirs upon the

[1] Vorläufige Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen. Leipzig, 1761.

[2] Versuche und Beobachtungen über die Bastarderzeugung im Pflanzenreich. Stuttgart, 1849.

[3] Journal Royal Horticultural Society, 1850.

[4] On Amaryllidaceæ, to which is appended a treatise on Cross-bred Vegetables. London, 1837.

[5] Die Bastardbefruchtung im Pflanzenreich. Berlin, 1865. Chiefly devoted to hybrid-willows.

[6] Fécondation et Hybridation. Paris.

[7] The Propagation and Improvement of Cultivated Plants. F. W. Burbidge. London, 1877. A convenient and very useful hand-book.

topic, but embraces hundreds of important though minor papers scattered through the reports of societies and the columns of our agricultural and horticultural journals. Many of you are doubtless familiar with the valuable addresses of Col. Wilder,[1] Mr. Pringle,[2] and others, upon this subject; and you are aware that there is now felt a very deep interest in its practical bearings upon the future of our cultivated plants. The correspondents in this country, whom I have, perhaps, wearied by my pertinacious search for information, have placed me in possession of the results of the more important experiments which have been made here.

The narrow limits of my time do not allow me to mention or name all of those who have aided me by their letters; but I must be permitted to say, that, although my earliest inquiries by letter respecting this matter yielded scanty returns, I was later rewarded by discovering that a vast amount of careful hybridizing has been well done in this country. Much of this hybridizing, if not most, has been between marked varieties, instead of between recognized species; but the results, in many cases, are of great interest, and should be brought together for comparison and study. An account of the hybridizing already well done in this country, and of which we have no printed record, is a great *desideratum.* Such an account would surprise you, as its details surprised me, by the number and range of the experiments. One of the most instructive cases of hybridizing in this country has been selected for illustration. The full account of the experiments will be published by Mr. Francis Parkman in a forthcoming number of the Bulletin of the Bussey Institution. The author has kindly permitted me to make use of advance sheets of this communication; and you will prefer to have the statement of the experiments and of their results in Mr. Parkman's words.[3]

"My first attempt was to combine the two superb Japanese lilies, *L. speciosum* (*lancifolium*) and *L. auratum.* The former was used as the female parent. Four or five varieties of it, varying from pure white to deep red, were brought forward in pots under glass. This was neces-

[1] Report of Massachusetts Horticultural Society.

[2] Report of Vermont Board of Agriculture.

[3] Three paintings of these lilies were used in the lecture to illustrate the difference between the parent species and the hybrid offspring.

sary, because *L. speciosum* does not ripen its seed in the open air in the climate of New England. When the flowers were on the point of opening, the anthers were carefully removed from the expanding buds by means of forceps. As the pollen was entirely unripe, and as pains were taken to leave not a single anther in any of the flowers, self-impregnation was impossible. The pollen of *L. auratum* was then applied to the pistils as soon as they were in condition to receive it. Impregnation took place in most cases. The seed-pods swelled, and promised an ample crop of seed; but the experiment was spoiled by the bad management of the man in charge of the green-house, in consequence of which the pods were attacked by mildew.

"In the next year I repeated the attempt, with the same precautions. This time the seed was successfully ripened. Being sown immediately, a portion of it germinated in the following spring, and the rest a year later. In regard to this seed, two points were noticeable: first, it was scanty, the pods (though looking well) being in great part filled with abortive seed, or mere chaff; and, next, such good seed as there was differed in appearance from the seed of the same lily fertilized by the pollen of its own species. The latter is smooth, whereas the hybrid seed was rough and wrinkled. About fifty young seedlings resulted from it; and their appearance was very encouraging, because the stems of nearly all were mottled in a manner characteristic of *L. auratum*, but not of *L. speciosum*. Here, then, was a plain indication of the influence of the male parent. The infant bulbs were pricked out into a cold-frame, and left there three or four years, when, having reached the size of a pigeon's egg, they were planted in a bed for blooming. This was in 1869. Towards midsummer, one of the young hybrids showed a large flower-bud much like that of its male parent, *L. auratum*. The rest, about fifty in all, showed no buds until some time after; and, when the buds at length appeared, they were precisely like those of the female parent, *L. speciosum*. The first bud opened on the 7th of August, and proved a magnificent flower, nine and a half inches in diameter, resembling *L. auratum* in fragrance and form, and the most brilliant varieties of *L. speciosum* in color. In the following year it measured nearly twelve inches from tip to tip of the extended petals; and in England it has since reached fourteen inches. A colored plate of it will be found in 'The Florist and Pomologist;' and engravings of it have appeared in 'The Gardener's Chronicle,' and other horticultural publications. The stock has been placed in the hands of Mr. Anthony Waterer, the distinguished nurseryman, who has given it the name of *L. Parkmanni*. In this one instance the experiment had been a great success; but of the remaining fifty hybrids, not one produced a flower in the least distinguishable from that of the pure *L. speciosum*. The influence of the alien pollen was shown, as before noticed, in the markings of the stem, and also in a diminished power of seed-bearing; but this was all.

"In the next year, wishing to see if the male parent would not make his influence appear more distinctly in the second generation, I fertilized several of these fifty hybrids with the pollen of *L. auratum*, precisely as their female parent had been fertilized. The crop of seed was extremely

scanty; but there was enough to produce eight or ten young bulbs. Of these, when they bloomed, one bore a flower combining the features of both parents; but, though large, it was far inferior to *L. Parkmanni* in form and color. The remaining flowers were not distinguishable from those of the pure *L. speciosum.*"

The communication contains also an account of the author's experiments upon other lilies; and its value is increased by most suggestive comments upon the results. I do not know where you can find a more instructive lesson in hybridizing plants than is afforded by a careful study of Mr. Parkman's paper.

The relations of this special case to other cases of hybridizing will become clear when you have examined, later in the evening, the general principles believed to be established: at present I shall merely call your attention to a few of the more important practical points to be derived from it. 1st, Selection of promising species. Here is where your judgment must be called upon. 2d, Care in preparing your plants for the process: this makes a demand upon your skill as a cultivator. 3d, Complete removal of its own pollen from the flower to be impregnated. The stamens are to be cut away, and taken out by delicate forceps, before the bud has opened, or while it is expanding. 4th, Application of the desired pollen at the moment when the stigma is fitted to receive it. 5th, Subsequent care of the plant while the seeds are maturing. 6th, The great probability of discouraging results. Suppose the single hybrid which alone was wished for had failed to grow, and the results were to be judged only by the fifty inferior hybrids. One has said that the production of hybrids is like a game of chance with nature; but the odds are rather heavily against you. It is a lottery in which there are many blanks and few prizes; but the prizes are precious.

Is there any law governing the chances? or is this simply playing against loaded dice? An answer to that question may be found in the remarkable treatise by Professor Nägeli [1] of Munich, in which some general principles respecting hybrids in plants are clearly presented and fully illustrated.

[1] Published in Sitzungsberichte der Kais. Bayer. Akad. der Wissenschaften zu München, 1865. ii. Heft iv. Partly continued in the number for Jan. 13, 1866.

It has occurred to me that it will be interesting to you to examine these principles somewhat carefully, and I shall therefore ask you to consider them at this time. So far as I am aware, they are not given in detail in any English work, although you will find an excellent digest in the text-book of botany by Professor Sachs.[1]

Professor Nägeli's propositions will now be taken up in their order, and each one will be slightly recast in order to render the meaning clearer to those who have not made a special study of botany. Many of the propositions will lose their original form, but will retain their exact meaning.

1. *Only those plants which are nearly related can cross.* Fertility, as a rule, does not go beyond the genus; very often it is restricted by the limits of the sub-genus, and sometimes is confined to varieties of a single species.

The different natural orders and genera are very diverse in this respect.[2]

2. *Plant-forms* (varieties and species) *hybridize with greater difficulty, and yield a smaller number of fertile seeds, in proportion to the remoteness of their sexual affinity.* This sexual affinity is not identical with that relationship which is recognized by external differences in form, color, and habit, nor with that internal relationship which is based upon chemical and physical constitution. Nevertheless, all three affinities, as a rule, occur together, and are parallel to one another. The action of the pollen upon the pistil is more or less complete. Nägeli enumerates the following grades:—

The first and lowest degree of action is that in which merely the ovary, and perhaps the calyx, grows somewhat, without appreciably affecting the ovules. A second grade is marked by greater growth of the ovary, and by slight enlargement of the ovules, which afterwards shrivel up. The third degree has small, imperfect fruits, with empty seeds; a fourth has good normal fruits, with empty seeds; a fifth has normal fruits, with apparently perfect seeds which have no germs; a sixth, good fruits, with seeds which have minute germs not capable of growth; a seventh, good fruits

[1] A Text-Book of Botany. By Professor Sachs. Translated by Bennet & Dyer. Oxford, 1875.

[2] For further explanation and details, see note A at the end of the lecture.

and good seeds, but the latter can vary as to number very widely. As proof of his proposition respecting sexual affinity, Nägeli adduces many cases in which species very closely resembling one another, and believed to be most nearly related, cannot be made to cross, while they will cross with species apparently far more remote. He calls attention also to the fact that we may be able to cross one species (A) by another (B), and yet not be able to cross B by A. For instance, Gärtner fertilized in five years seventy-nine flowers of *Nicotiana paniculata*, L., by pollen from *Nicotiana Langsdorfii*, W.: sixty-six set fruit, and all had a good many seeds. But he tried to fertilize *N. Langsdorfii* by pollen from *N. paniculata*, without any effect. Kölreuter impregnated *Mirabilis Jalapa*, L., readily by the pollen of *Mirabilis longiflora*, L.; but, in two hundred trials to fertilize *M. longiflora* by *M. Jalapa*, he utterly failed to obtain any seed. These latter experiments covered a period of eight years. You will also notice, in an examination of Mr. Parkman's paper, that lilies afford excellent examples of this peculiarity. There are some lilies which will serve only as the female parent. The list of cases may be greatly extended; but I shall only point out the fact, that differences — the same in kind, though less in degree — have been observed among varieties of the same species; for instance, some varieties of Indian corn.

3. *The fertility of hybrids and the number of good seeds, depend upon the degree of sexual affinity.* Species-hybrids are, as a rule, less fertile than variety-hybrids. Without dwelling upon Nägeli's proofs adduced in support of this proposition, I will quote a single statement in passing: "We have good evidence that there are many grades in the fertility of hybrid forms, and that, in this respect, there is no sharp line to be drawn between variety-hybrids and species-hybrids."

4. That the sexual affinity is greater, and therefore hybrid-impregnation more readily ensues, yielding a larger number of seeds, and that the hybrids therefrom resulting are the more productive when self-fertilized, in those cases where the parent-forms are closely allied both in structure and in form, is a rule true only within certain limits. *Self-impregnation, as a general thing, appears to give fewer seeds, and plants of less vitality and fertility, than does cross-impregnation with a nearly allied variety.* This will be recognized by

some of you as another form of presenting the statements of Knight and Darwin respecting the desirability, or rather absolute necessity, of occasional cross-fertilization.

5. If different kinds of pollen are applied to the stigma simultaneously, that alone takes effect which has the greatest sexual affinity. The presence of pollen of the same species, as a rule, excludes hybrid-fertilization by other species; but, on the other hand, the pollen of a different variety can easily prevent self-fertilization. The power of exclusion does not exist, however, when impregnation has taken place. Since, therefore, fertilization ensues more slowly from pollen of slight affinity, pollen of greater affinity, which is applied later, can act at the same time, and give rise to two kinds of seeds in the same fruit. Hybrid-fertilization can take place in the case of *Nicotiana* in two hours, in *Malva* and *Hibiscus* in three hours, in *Dianthus* in from five to six hours, after the application of their own pollen. Observation has shown that often these short periods suffice to remove the hindrance just referred to.

6. The *characteristic* power of the pollen is exerted only on the germ-vesicle and the germ resulting from impregnation. All other changes would take place in their sequence from any active pollen. Hybrid-fertilization does not, as such, affect the mother, but the offspring. This statement, which, like the others, I have endeavored to give as nearly as possible in Nägeli's own words, will at once call to your minds the apparent exceptions in certain fruits.[1] Without attempting to defend the position, I will cite only one phrase respecting this: "Artificial impregnation shows that this fundamental proposition is true without any exception."

7. The hybrid produced from the blending of two parent-forms stands between the two so far as its systematic (or external) characters are concerned. For the most part, it occupies a middle position; less often it inclines more to one or the other. The cases in which the hybrid resembles one parent rather than the other are more striking in variety-hybrids than in species-hybrids: in the former some non-essential characters are seen side by side in the progeny, but uncombined.

8. The general rule that the characters of hybrids lie some-

[1] See note B at the end of the lecture.

where between those of the parent-forms has exceptions. On the one hand, on account of individual variation, some characters may pass beyond these limits, especially when the cross is between varieties of the same species. On the other hand, in species-hybrids there is a deviation from the rule, owing to the fact that crosses between nearly related species are weakened in the essential organs (stamens and pistil), but in their organs of vegetation (root, stem, and leaf) are more luxuriant. Hybrids of remote species develop very imperfectly in all their parts, and, from lack of energy in the vital processes, soon perish.

According to Nägeli, species-hybrids often exhibit some very remarkable characters. Their growth and development may be so much modified, that they exceed their parents in size, and excel them in vigor. Their leaves may be larger and more numerous, the root-system much richer. Their buds may be larger and stronger, and the facility with which bud propagation can be accomplished be increased. They have frequently a longer lease of life; annuals sometimes giving rise to biennials or to perennials. They are generally more hardy, and they bear exposure to cold and to rough weather somewhat better. They often bloom earlier, have flowers of richer color, of greater fragrance, and there is a marked tendency towards the production of double blossoms. On the other hand, the stamens and pistil are almost always proportionally weak.

9. In general, hybrids vary less in the first generation in proportion to the remoteness of the parent-forms. Species-hybrids vary less than variety-hybrids; the former being characterized by uniformity, the latter by diversity. If, however, the hybrid is self-fertilized, the variability is greatly increased, sometimes in an extraordinary manner when it did not vary in the first generation.

In short, as has been well shown by Naudin[1] and by others, when a hybrid is produced, we have secured a plant which has a tendency to vary; and of this tendency cultivators can make great use. A hybrid, or its descendants at least, can be said to drift; and a skilled hand can take advantage of this drifting, and to a great extent, by selection, direct the subsequent course. Here is one of the great advantages of

[1] See note C at the end of the lecture.

hybridizing. You have learned from President Chadbourne in what way varieties are improved: in hybridizing you secure a marked tendency to the production of varieties, some of which you can turn to account.

In presenting the views of Professor Nägeli, and in commenting upon them, I have endeavored to put you in possession of the more important facts representing artificial hybridization, and I have also sought to keep from encroaching upon disputed ground. The general theory of hybrids, and the interesting allied subjects of derivative hybrids and graft-hybrids, cannot now be entered upon, but must be left wholly untouched. It only remains for me to urge you to venture upon experiments in this field. A few in this audience have already accomplished much. The history of the improved varieties of corn and potatoes shows you that much has been done: the excellent results indicate that there is great encouragement for the future. Remember that the requisites to success in such an undertaking are the following, — knowledge of the plants with which you work, a familiarity with what has already been done with the same species, skill in your manipulation of the pollen and in other details of practice, and, lastly, a good heart against the discouragements which will meet you at the outset. Even a cursory examination of the subject will convince you that here lies before you, as practical men, a broad and inviting field of profitable labor.

A. The cases in which hybrids have been produced between genera are given by Nägeli (p. 399 of his work) as follows: —

Lychnis and *Silene*.
Rhododendron and *Azalea*.
Rhododendron and *Rhodora*.
Rhodora and *Azalea*.
Rhododendron and *Kalmia*.
Rhododendron and *Menziesia*.
Ægilops and *Triticum*.
The genera of *Cactaceæ*.
The genera of *Gesneriaceæ*.

Of those above mentioned the following have been recently placed by Bentham and Hooker in a single genus, — Rhododendron, Azalea, and Rhodora.

To these genera may be added the case in which orchids have been crossed, Calanthe and Limatodes in the production of Calanthe Veitchii.

Other instances are on record, some of which will not bear very close scrutiny.

It may be said that Herbert, whose work was referred to in the lecture, held that genera can never be crossed. He believed, that, in all cases where a hybrid results from plants of two so-called genera, the very fact of fertility proves that the two plants should be assigned to the same genus.

The orders in which hybrids are most readily formed are the following: Liliaceæ, Iridaceæ, Nyctaginaceæ, Lobeliaceæ, Solanaceæ, Scrophulariaceæ, Gesneriaceæ, Primulaceæ, Ericaceæ, Ranunculaceæ, Passifloraceæ, Cactaceæ, Caryophyllaceæ, Malvaceæ, Geraniaceæ, Onagraceæ, Rosaceæ.

The orders not inclined to yield hybrids are Framineæ, Urticaceæ, Labiatæ, Convolvulaceæ, Polemoniaceæ, Saxifragaceæ, Papaveraceæ, Cruciferæ, Hypericaceæ, Papilionaceæ.

The genera of the same order behave very differently in respect to ease of hybridization; thus Dianthus species cross readily, those of Silene with difficulty. (Nageli, p. 401.)

B. See a paper by Maximowicz on the Influence of Foreign Pollen on the Form of the Fruit Produced, Journal Royal Horticultural Society, 1873, p. 161.

C. The very valuable paper by Naudin is given in English in the Journal Royal Agricultural Society, 1866, pp. 1–9.

THIRD DAY.

The morning session began at half-past nine o'clock.

Capt. Moore called the meeting to order, and introduced as the chairman for the day O. B. Hadwen, Esq., of Worcester.

The Chairman. Gentlemen, the subject for the morning is the management of night-soil; and a paper furnished by Gen. N. N. Halsted of Newark, N.J., will be read by the secretary.

THE MANAGEMENT OF NIGHT-SOIL.

BY GEN. N. N. HALSTED.

"Whatever may be its constitution and physical properties, land yields lucrative crops only in proportion as it contains an adequate quantity of organic matter in a more or less advanced state of decomposition." These words were uttered more than thirty years ago by no less an authority than the celebrated I. B. Boussingault. In the experience of scientific agriculture of to-day, they amount to a truism, and yet

they may serve as a text for any agricultural thesis. It follows, then, as a necessary corollary, that you can no more continue to draw from a soil, however fertile, the elements which go to form a crop, and look to maintain that condition of fertility, without restoring in a measure such abstracted elements, than you can expect to sustain animal life without food. Just as a man or animal deprived of food will emaciate and diminish in weight day by day, until starvation ends in death, so will the most fertile soil, when deprived, by a series of successions of one and the same crop, of the elements which enter into the composition of that crop or plant, in the end become utterly barren so far as that crop is concerned.

Carry on this process, then, through a variety of crops, and, as a result, you have at last absolute *sterility*. What once might have been as rich as the famed fields of Egypt has become as sterile as the Great Desert, whose trackless wastes crowd the very shores of the fertilizing Nile. This brings us to the consideration of the subject of *manures*, — a subject which has exercised the minds of all tillers of the soil from the time of the Bible patriarchs to the present day. "Quid faciat lætas segetes" was a question two thousand years before the Latin poet sang to his princely patron the mysteries of the agricultural art.

The aversion of man to labor prompted him, when he first commenced to dwell in fixed habitations and till the land about him, to select first the rich alluvial soils, in the which he found vegetation to grow the rankest: afterwards, as these soils became exhausted of the elements to produce his desired crops, he was driven to the use of manures to restore to the soil the elements abstracted. The first manure, then, used by him must have been that of the animals domesticated by him. We have only, in verification of this statement, to look back through very recent times to the settlers of the rich prairies of the West, with whom, for a period, the accumulation of manure about the farm-sheds was a nuisance to abate which the easiest way was found to consist in removing the buildings rather than the manure. As population increased, and poorer soils were taken up and tilled, the question of manuring, or how to make a poor soil yield a crop, has been the greatest problem in agriculture. Such it is to-day, — the highest tax on the labor of the husbandman.

He who can lift or lighten this tax by supplementing the supply of the fertilizing material, by diminishing its cost, or by saving labor in the manner of its application, is a benefactor indeed, not only to the husbandman, but to the entire human family. The application of the science of chemistry to agriculture has given us the constituents of every plant we raise: it has also made us acquainted with the ingredients contained in the liquid and solid excrements of man and animals. We are told, that, in the application of these, "we restore to our fields the ashes of the plants which served to nourish these animals;" that these ashes consist of certain soluble salts and insoluble earths, which a fertile soil must yield as indispensable to the growth of cultivated plants. Knowing, then, that the constituents of food pass over into the urine and the excrements of the animal which consumes it, we come to the grand conclusion which Liebig sums up in these words: namely, "*The solid and liquid excrements of an animal are of the highest value as manure for those plants which furnished food to the animal.*" Now, bearing these principles in mind, let us pass one step further. Man, as the lord of creation, tills the soil; he domesticates and subjugates to his use the cattle, and the smaller animals which pasture on a thousand hills. He has also made the birds of the air and the feathered tribe, to be, with animals, dependent upon him; he tills the soil, to raise food for the support of these as well as for himself, and, in turn, he is fed and nourished by their bodies. Does it not follow, then, as a certainty, that the constituents removed from the soil, and represented in the bodies of these animals,—in the grain, vegetables, and fruit consumed by man,—may all be found in his own liquid and solid excrements, and in the bones of the slaughtered animals eaten by him? This consequence brings us to our theme,—the highest type of all manures, *night-soil*. We propose to consider the subject under these three heads: First, the history of its use; second, its value and the advantage it possesses over other fertilizers; third, the care of it, with its preparation or mode of handling.

If we seek the origin of its use, we must, undoubtedly, look to the Chinese, the oldest agricultural people of whom we have any knowledge. We find a people inhabiting a country with an area of 1,297,999 square miles, with a popu-

lation of four hundred million, — a people among whom agriculture is held in higher estimation than, perhaps, in any other country in the world. The necessities of these people to make every foot of land yield its utmost to sustain their teeming population have made them look upon this subject of manure as a vital question. So high is the estimate set by these people on human excretions, that their laws forbid its waste. Receptacles for securing it are placed along the roads and in convenient places; and the oldest and most helpless persons are not deemed wholly useless to the family by which they are supported. The Chinese mix the fresh night-soil with clay, which is then formed into cakes, and dried, and, under the name of *tafeu*, becomes an extensive article of commerce in the neighborhood of their populous cities. What in European towns would be considered an intolerable nuisance is here looked upon with the utmost complacency. The coolies, who carry each morning the produce of their farms to market, bring back each one two buckets of the precious material slung at the ends of his bamboo-pole. It is not only the Chinese who have set such value on night-soil. The ancient Latin and Greek writers have discoursed largely on the use of manures, and it is hardly to be supposed that they overlooked the value of night-soil. Two thousand years ago, the oldest of the Roman teachers of agriculture, in answer to the question "What is good tillage," stated the first requisite as "To plough," the second "To plough," the third "To manure." Study, said he, "to have a large dunghill; keep your compost carefully; when you carry it out, scatter it, and pulverize it; carry it out in the autumn; lay dung around the roots of your olives in autumn."

The greatest of all the Latin poets, the immortal Virgil, scientist as well as poet, did not disdain to discourse of the economy of a farm in his sublime "Georgics." Discoursing to a people whose chief magistrates had been husbandmen, such as Lucius Cincinnatus, called from the plough to be dictator; such, too, as Fabricius, Curius, and Camillus, no less distinguished in agriculture than in the art of war; to a people who held the husbandmen in such esteem as jealously to resent any affront to their calling, — this poet lauds the use of "*fat dung*" as a fertilizer. *Among modern nations* we find two of the most refined countries of Europe, and the

most distinguished in agricultural science, rising above the prejudice of the times, and largely utilizing night-soil. France and Belgium share this honor between them, and have taught the rest of the civilized world, not only the value of this manure, but how to bring it into use. That its use in England was so long delayed by agriculturists who have been foremost in all scientific discoveries and improvements in the art, as well as in crops, in feeding, and in stock-raising, can only be attributed to the force of prejudice and a squeamishness out of place in the practice of husbandry. Its introduction into this country as an article of commerce, leading to the popular use of the crude material, is due to the late Anthony Dey, an agriculturist and lawyer who practised in the city of New York in the early part of the present century. Having taken a leaf from the book of the French agriculturists, he established on the banks of the Hackensack, in the meadows remote from all habitations, a factory to utilize the products of the sinks of the city of New York, which in those days, before the introduction of Croton water, was an intolerable nuisance, which was got rid of *sub nocte* by dumping it into the rivers. The business exists there to this day; and the farmers of old Bergen and Hudson Counties will attest to how their corn-fields have been gladdened by the use of "poudrette," or, as they called it, "powderette."

Now, passing from the history of its use, let us consider, *Second*, *Its value.* This consideration will require that we look first at the analysis of its constituents. These we find, according to Berzelius (the most generally quoted authority) to be as follows: —

HUMAN EXCREMENTS.

Remains of food	7.0
Bile	0.9
Albumen	0.9
A peculiar extractive matter	2.7
Indeterminate animal matter, viscous matter, resin, and an insoluble residuum	14.0
Salts	1.2
Water	73.3
	100.0

HUMAN URINE.

Urea	3.01
Uric acid	0.10
Indeterminate animal matter, lactic acid, and lactate of ammonia,	1.71
Mucus of the bladder	0.03
Sulphate of potash	0.37
Sulphate of soda	0.32
Phosphate of soda	0.29
Chloride of sodium	0.45
Phosphate of ammonia	0.17
Chlohydrate of ammonia	0.15
Phosphate of lime and magnesia	0.10
Silica a trace	
Water	93.30
	100.00

THE SALTS HAD THE FOLLOWING.

Carbonate of soda	29.4
Chloride of sodium	23.5
Sulphate of soda	11.8
Ammoniaco magnesian phosphate	11.8
Phosphate of lime	23.5
	100.0

It will be seen that I have grouped the two materials, the analysis of each of which is above given, under the common head of night-soil. I am aware that they are generally separated in treatises on the subject, and urine made to play the important part as distinct from feculant matter. I see no reason why they should not both be included under the head of night-soil, and the combination of the two be considered as forming that material. It cannot be denied that the quality of night-soil must depend, in a great degree, on the quality and quantity of food consumed by those who furnish the materials, as well as the care used not to mingle indiscriminately other wastes with the material. An amusing anecdote is related, by a French writer on the subject, of a farmer who had purchased the produce of the *cabinet* of one of the most celebrated restaurants of the Palais Royal in Paris. Greatly encouraged by the success of his experiment, as evidenced in his crops, and being desirous of going into the business on a larger scale, he contracted for the monopoly of the products of several of the military barracks of Paris. The poor fellow was doomed to a bitter disappointment. The

manure he now obtained had a very different effect from that of his first venture; and his philosophy was taught to comprehend the difference between the rich and varied feed of the *habitués* of the Palais Royal, and a soldier's rations, — simply he lost money by his bargain.

The distinguished agricultural chemist Liebig, quoting Boussingault, speaking of the value of night-soil as compared with other manures, says, "On the assumption that the liquid and solid excrements of man amount, on an average, to only a pound and a half daily (a pound and a quarter of urine and one-quarter pound fæces), and that both taken together contain three per cent of nitrogen, then in one year they will amount to five hundred and forty-seven pounds, containing 16.41 pounds of nitrogen, — a quantity sufficient to yield the nitrogen of eight hundred pounds of wheat, rye, oats, or nine hundred pounds of barley." He further adds, "This is much more than it is necessary to add to an acre of land in order to obtain, with the assistance of the nitrogen absorbed from the atmosphere, the richest crops every year.

"By adopting a system of rotation of crops, every town and farm might thus supply itself with the manure, which, besides containing the most nitrogen, contains also the most phosphates. By using at the same time bones and the lixiviated ashes of wood, *animal excrements might be completely dispensed with on many kinds of soil.*" We emphasize the closing sentence of the paragraph, and in doing so refer you back to the analysis we have given above. Our space will not admit of our giving a comparative analysis of other manures: we simply allude to the fact of *night-soil* being pre-eminently rich in nitrogen, and why so? The reason is plain; on account of the *variety* of food consumed by man. The herb of the field, the grain, the grass that feeds the beef and the smaller animals, that beef and those lesser consumers themselves, the vegetables the pride of his garden, the luscious fruits in all their countless variety, — mixed and mingled, victuals and drink, — all conglomerate this element of nitrogen. Hear what the same Liebig says of its importance: "We cannot suppose that a plant could attain maturity, even in the richest vegetable mould, without the presence of matter containing nitrogen, since we know that nitrogen exists in every part of the vegetable structure."

By way of comparison, we would only add that one hundred parts of the urine of a healthy man are equal to thirteen hundred parts of the fresh dung of a horse (our authority the same, Liebig). Physiology teaches us, that, in the economy of man, his urine contains all the soluble mineral substances of his food; the solid excrements contain those ingredients which are not soluble in water. We would, in this respect, allude to the analogy between nature's process and man's analysis. Burn the food of man, and conserve the ashes, and the result is the same as with the internal fire of man, oxygen. The urine contains the soluble salts, and the fæces the insoluble salts, of both processes.

We have spoken of the advantages and value of night-soil as a manure, in reference to its containing the elements of all plants according to chemical analysis. Let us further consider its advantages relative to application; and, first, it is a well-known fact that barnyard-manure is not immediately felt on the first crop in its intensity. While, undoubtedly, it feeds and stimulates the first crop, yet its powers are not therein exhausted; and this constitutes the boast of the unskilled husbandman. He will cart out the contents of his barnyard and manure-heaps by the hundred cords, and deposit them carefully in heaps on his fields, to be afterwards spread and ploughed in. He takes no note of the time spent in this laborious operation, but goes through it as the routine of a lifetime, with no better reason than that his father did so before him. The fact that he does not get the full benefit of his labor and manure in the first crop is to his mind a higher proof of the correctness of his tillage. Now, the idea of saving labor in the application of manure does not enter into his economy: he does not consider time as money, nor yet, again, can he understand that rapidity of action in a manure can be a valuable quality. In other words, he must be blind to the fact that he may have a manure which will not only save him time and labor, but which, at a less cost, will give him a more abundant crop, and also permanently enrich his land; and this may all be claimed for *night-soil.* We may here refer again to the practice of the Chinese, and the advantage they derive from the almost exclusive use of this manure. It is said that their fields seem to grow nothing but the plant which is the object of solicitude with the

farmer; that it is a difficult matter to find in their fields such a thing as a weed. What a contrast their fields must present to ours, which are annually sowed with a fresh crop of weeds, either by the crop already on the ground going to seed, or by a reseeding in the manure applied! What would a Chinese farmer think of one of our grass-lots in the month of June, white with the ox-eye daisy, and presenting the appearance of a struggle between the grass and the weed, for the possession of the land, with a poor show for the grass? Who can estimate the robbery of land by a crop of weeds?

If, by the use of night-soil as a manure, a farmer could create a revolution in this respect, would he not be a benefactor to his neighbors? The activity of night-soil as a manure is, then, one of its chief advantages; and this, in a great measure, is due to the very large proportion of azotized principles it possesses. It is from this azote that the ammonia is derived; and it is ascertained that a man passes nearly half an ounce of azote with his urine in the course of twenty-four hours.

Ammonia, it is scarcely necessary to add, is the stimulating principle of all manures, and especially that of guano. But, as our object is not a dissertation on agricultural chemistry, we will not further pursue the subject into the domains of science, or mystify it with technical terms. We have shown in brief the value of *night-soil* as a manure, the high estimation in which it is held in some countries, and the advantages in its use. We crave a little patience, while, in connection with its value, we show what is lost by its waste. In that admirable and thoroughly-practical work of H. Stephens and Professor Norton, entitled "The Farmer's Guide to Scientific and Practical Agriculture," the subject of liquid manures is very carefully considered. The contrast between the towns of the interior in England, where the sewage is taken advantage of for irrigation and for manuring garden-ground, and the seaport towns where it is allowed to flow into the rivers or ocean, is most strikingly set forth. It is stated, that, in the environs of Edinburgh, poor sandy soils not worth above twenty shillings per acre, have, by the sewage of the town, been converted into rich meadows, yielding a rent of at least twenty pounds per acre. We quote the language of the book on the subject of waste of this mate-

rial as clear and decisive. Now, saith the author, when we consider what escapes from every human being every year in dung and urine, and add to these the washings of soap-grease and other materials incidental to domestic purposes, we may imagine the enormous quantity of the most valuable matter as manure which is thus lost every year,—literally wasted. Take one instance, a striking one, that of London.

It has been ascertained by Boussingault, that a man in a healthy state passes three pounds of urine daily; and Liebig states, that, in the same state, he voids five ounces and a half of dung. These two quantities give a total annual quantity of 1,220 pounds of liquid and solid manure voided by every person, on the average. Now, taking two million as the population of London, the quantities of those manures voided by the inhabitants of the metropolis amount annually to 1,089,285 tons. Chemistry has ascertained that the component parts of the excrements of man are as valuable to vegetation as those of guano; and, as the different sorts of guano sell from six pounds to ten pounds per ton, we are warranted in estimating the value of night-soil and urine at eight pounds per ton, which would give the entire value of this manure in London alone every year at £8,714,280, or $43,571,400 in gold. This may seem like exaggeration; but put it at half the amount, and the subject is serious enough to address itself to every thinking mind. This waste is not the worst of it. We claim that there is a *sanitary* point of view, higher in importance than all considerations of moneyed value: we mean so far as this waste of sewage into the rivers affects the supply of drinking-water for our cities. We take two prominent instances within the State of New Jersey; the two largest cities both taking their supply of water from the same source,—the Passaic River. This river, furnishing an illimitable supply, takes the drainage of the large manufacturing town of Paterson, and the smaller towns along the river, to the points where the supply is taken up: in addition to these, the sewage of the city of Newark, with a hundred and twenty-five thousand population, discharged into the Passaic River, is carried up by every flood-tide beyond the city, and to the very conduits where the water is taken for the supply of the two cities Newark and Jersey City. The operations of the United States Govern-

ment in removing the reef, and the obstructions to navigation in the river above the city of Newark, have greatly facilitated this flow; and there can now be no question but that the supply of each city is contaminated by this sewage. The joint commission of Newark and Jersey City employed an eminent chemist to analyze the waters of the Passaic as furnished the two cities. We quote so much of his report treating of sewage pollution of rivers as applies forcibly to our subject, and the sanitary point now involved: "That class of scientists who study microscopic fungi, mycologists (in common with many distinguished scientific physicians), are now settling down to the belief that most epidemic and epizoötic diseases are accompanied (as causes, not merely as effects) by certain fungoid growths: in other words, that these diseases are produced by vegetable parasites. When these fungi take root in live animal tissues, they develop into abnormal and monstrous forms, which have not been recognized until lately; but it is now known that the spores discharged (by millions of millions it may be) with the excreta, when cultivated outside the body, come back again to their normal forms, and the fungi are recognizable. Thus in common dysentery and cholera-morbus, the spores, when replanted, produce a common fungoid parasite of wheat; while, during the fearful Asiatic cholera, the spores produced a parasite of the East-India rice-plant. These facts (if they must be admitted as such, which seems inevitable) are suggestive with regard to sewage contamination of rivers. One case of cholera brought to Paterson, or any of the towns lying on the upper Passaic, might fill the whole river with the living seeds of the pestilence. A like propagation would take place from Newark throughout Jersey City and Hoboken, and even throughout Newark itself. I am aware that these are appalling considerations, and may be rejected by some as contingencies too remote and dreadful to be possible. But human experience, alas! will not countenance any such puerile view as this. We must stare these horrors sternly in the face, bring all our science to bear, and study prevention, rather than wait till called upon to endure the evil when it shall have passed beyond our cure."

It is not only river-water that is contaminated by the sewage of the cities; but the wells, from which many of the

inhabitants derive their sole supply of cool drinking-water, in their innocence supposing they are drinking the purest and best, are also poisoned. We give a single instance in illustration. A well in Market Street in the city of Newark, standing in front of the office of one of the daily journals of that city, had been so lauded for its cool and sparkling water, that people were wont to stop and refresh themselves with a drink from its pump: nay, instances were frequent of passers-by in the throng of Broad Street crossing over and going down to this pump, as if to a favorite soda-fount. It might have been a rival, for aught we know, to some such popular establishment in its vicinity. This well, with two others very much used, was designated by the chief engineer of the Water Board, to Professor Wurtz, as among those of the city most resorted to. Samples were taken; and, on analysis, the one we have selected was found to contain, in the words of the professor, "about five grains to the gallon of an ingredient which cannot be traced to any other source than the infiltration of urine of man or beast, or both." He further recommended the closing of this well to the public use, and it was done.

These words require no comment: they speak for themselves. Let us pass now to a rapid consideration of our third division; namely, *Third*, The care of night-soil, its preparation and mode of handling. We have shown, that, on economic and sanitary principles, it should not pass into the sewage of the city. What goes into a navigable river, the source of the drinking-supply of that city, should be only the product of the water-shed. The care of the other waste should demand the most earnest attention of the *authorities*, and the application of the highest engineering skill; for this sewage belongs to the land, and not to the sea.

The modern earth-closet is an admirable contrivance for preserving this manure in private dwellings without annoyance to the inmates. The French were the first to set us the example. Formerly the excrements were preserved in the houses in open casks, from which they were collected, and placed in deep pits at Montfauçon, where they were dried by exposure to the air, and evaporation. It then became an object of commerce, which is now well known in this country under the name of *poudrette*. In French Flanders this

human soil is collected with especial care. Boussingault, speaking of the system in Flanders, says, "The reservoir for its preservation ought to be one of the essential articles in every farming establishment, as it is in Flanders, where there is always a cesspool in masonry, with an arch turned over it, for the purpose of collecting this invaluable manure. The bottom is cemented and paved: two openings are left, one, in the middle of the turned arch, for the introduction of the material; the other smaller, and made on the north side, is for the admission of the air, which is requisite for the fermentation." The Flemish reservoir may be of the dimensions of about thirty-five cubic yards. Whenever the necessary operations of the farm will permit, the carts are sent off to the neighboring town to purchase night-soil, which is then discharged into the reservoir, where it usually remains for several months before being carried out upon the land.

For the average American farmer, such cisterns and the system spoken of would be too complicated and too expensive; but a cistern of moderate depth and dimensions may be constructed on any farm. A good method of making night-soil portable at small expense is a great desideratum. The difficulty is in converting urine into a solid form. The use of a cistern for the purpose of collecting, storing, and fermenting the crude material, seems indispensable: the next thing is to deodorize the material, and free it from the disgust attending its manipulation and application. In Paris, the material is rendered inodorous by gradually pouring into the box or vessel containing it a solution of zinc and chloride of calcium, until it ceases to exhale an unpleasant smell on stirring. The application of lime has been recommended for this purpose; but it is hardly necessary to explain to an intelligent mind that this would be at the risk of driving off some of the most valuable elements of the manure. There can be no surer way of getting rid of ammonia than by the addition of lime, especially in its quick state. It will not, of course, be understood, that, under this sweeping denunciation, gypsum, or sulphate of lime, is included. Ground plaster mingled with other drying materials might be advantageously added to fix the ammonia, and convert it, by the action of sulphuric acid contained, into sulphate of ammonia, which is a soluble salt, as is familiar to all intelligent agriculturists:

it, however, is slow in its action as a deodorizer. One of the most active and cheapest deodorizers is sulphate of iron, or green copperas. This material can be had at a cost of three cents per pound; and we might quote a familiar adage, and say, "A little goes a great way." This substance is soluble in two parts of cold water, or three-fourths its weight of boiling water. It can readily be applied in a fluid state, and will be found to be efficient in destroying the ill odor so objectionable in the use of this manure. The objection raised to its use is, that it combines with the phosphoric acid of the manure, and forms an insoluble salt of iron, thus withholding from the plant one of the most valuable elements contained in the manure. If the odor be killed, we should feel inclined to risk the loss of a portion of the phosphorus. We might also mention in this connection the use of muriatic acid, also a cheap agent, and acting almost instantaneously in its combination with the ammonia evolved in the fermentation of the manure. When the manure has lain in the tank or cistern until it is sufficiently fermented and deodorized, it should then be taken out and mingled in just proportions with an absorbent, which will serve the double purpose of putting the material into convenient shape to handle, and at the same time act as a divisor for an even distribution of this active and valuable fertilizer. The next question is, What shall this absorbent be? This will depend on the facilities at hand, or most easily procurable by the farmer. Dry clay, road-dust, the vegetable refuse of the farm, dried peat or muck, especially the latter, which in itself is a deodorizer, and a most valuable manure, from its consisting almost entirely, in a dried state, of organic matter. We have used very largely charcoal-braise, and, as the result of our own experience, place it in the highest rank, first as a deodorizer, secondly as an absorbent. Most readily does it act as an absorbent, and will fix the volatile ammonia without the use of muriatic acid or ground gypsum. Any quantity of this material can be had in the charcoal-burning regions, and at an expense simply of the labor of handling and cost of freight. For garden use, and where the soil is of stiff and light-colored clays, it acts most admirably in lightening up the soil, rendering it more friable, and also blackening its color, thereby attracting the rays of the sun, and warming

up into genial heat cold and slow soil. There are other materials within the easy reach of many, such as saw-dust for those in the neighborhood of saw-mills: this forms a good absorbent, and, as it decays in the ground, gives valuable food to the plants. We have largely used spent tan in compost. This seems at first sight a very intractable material; but, in thankful remembrance of the late Professor Mapes, we would suggest a mode taught by him which soon converts and subdues this stubborn material into practicable use: it is simply composting the material with a salt-and-lime mixture. The process is simple, and may be thus described: suspend in a cask of water a basket of rock-salt, facilitate its solution by daily stirring, and, when the water has taken up all the salt it can hold in solution, then use it in slacking quick-lime: the product is a chloride of lime, which, when composted with the spent tan, soon converts it into a shape fit to be used as a fertilizer, and into material which could be most advantageously used in combination with night-soil. While the night-soil lay in the cistern, the spent tan could be undergoing the salt-and-lime treatment. The refuse bone-black of the sugar refineries has been largely recommended by authors; but this material has such a glazed and hardened surface, that it requires treatment with sulphuric or muriatic acid to render it convertible, and in addition, though it was formerly a material gladly given away by the refineries, it has, since the manufacture of phosphate of lime in this country, become an article of commercial value, alike with the bones of animals.

Thus much for the mode of treatment, and rendering available for agricultural use, this much neglected fertilizer. We have spoken of its value as furnishing all the elements for a crop, of the labor saved over the proper care and distribution of barnyard-manure. As an article of commercial value, hear once more the words of the learned Liebig: "The importation of urine or of solid excrements from a foreign land is quite equivalent to the importation of corn and cattle. All these matters in a certain time assume the form of corn, flesh, and bones: they pass into the bodies of men, and again assume the same form which they originally possessed."

Lastly, We have spoken of the connection between the

utilizing of this material and the health of our towns and cities. The inception and the spread of contagious and infectious diseases, the result of crowd poison, every day's investigation, the deductions of science which crowd daily upon us in relation to this vital subject, the poisoning of our sources of water-supply, the breeding of infection in the air we breathe, — all combine to give the subject of this paper a deep and serious import, which should command the earnest attention of every intelligent member in a community.

We hope to see the day when what is now an intolerable nuisance, and a source of great disquiet, this material called "night-soil," may become the means of spreading fertility over our lands, and producing plenty and prosperity throughout our borders.

Mr. HERSEY of Hingham. This subject of fertilizers is one of the most important which can engage the attention of farmers. We differ so much in regard to what we shall do, that many of us do wrong, and I confess that I am very much in the dark on important points. There are some things, however, that seem to be self-evident to me; and the first is, that stable-manure furnishes all the necessary material to keep our land up in its proper condition. The second is, that our State does not furnish a sufficient quantity of that material to properly fertilize all the lands that we desire to cultivate. Consequently we are driven in every direction, and of late we have been driven in the direction of the concentrated mercantile fertilizers. I am very much in the dark in regard to them; and I think there is great question as to whether we can afford to use them or not. I rise for the purpose of calling up this part of the matter, and, if we can get any light upon it, I, for one, should like to have it. I want to know, first, whether we can afford to use special fertilizers, and, secondly, whether, if used year after year, they will keep the land up. Now, the first question is not so easy to answer. If we could answer that, it would be an answer really to the second. The second question, it seems to me, is one that we can answer in time. I do not know but that there are individuals in this room who can answer it to-day. If there are, I wish they would; for I consider that this is a very important question. If there are any concen-

trated fertilizers that we can put on our lands, year after year, and keep them up, there are large quantities of land in this State, which can be cultivated to advantage; and it will give us a chance to improve our agriculture, and improve our agricultural resources. I must confess that I am rather sceptical in regard to whether you can, by putting sixteen bushels of a fertilizer upon an acre, take off fifty bushels of corn and two tons and a half of fodder. I say, I am rather sceptical in regard to it; but I do not wish to express the opinion that it cannot be done, because I am aware that Nature is able to do many mysterious things. We frequently say that water will only run down hill; and yet, when we come to examine the matter, we find that it cannot run down hill until Nature makes it first go up. It all has to go up first, and it is done very silently. I am not certain that we cannot produce fifty bushels of corn and two tons and a half of fodder with sixteen bushels of fertilizer; but it will be a wonderful thing if we can. There is one thing which leads me to think this is possible. You all know that Nature, when left to herself, is able to fertilize the land. For example, we know very well that barren knolls, if left to themselves, will throw up little shrubs, which will become trees in the course of twenty-five or thirty years, and furnish perhaps more than one hundred tons of solid material; and yet, when that material is taken away, the land is left in better condition than it was when the growth of the wood first commenced. This shows that Nature has the power of replenishing herself in some way. But whether this can be carried out in our annual crops, is what I desire to know. I am trying the experiment myself; and, if I live long enough, I shall know from my own experiments whether this can be done or not. I rose simply to make this inquiry, hoping that there may be individuals present who have tried the experiments.

Mr. PHILBRICK of Newton Centre. I have been very much interested in the lecture which has just been read. It touches a point of vital importance to every farmer. We all of us depend upon manure. We cannot get enough of it, and we want to know how to obtain a supply. We have been told, that, in China and other foreign countries, they utilize night-soil, and do it profitably. I wish I could say that the experiments of farmers in this neighborhood have

proved that they can do it profitably here. As many of you know, I am a farmer myself; and I have for the last eight or ten years used considerable night-soil. I have labored under a great deal of difficulty in getting good material. The habits of our people are very different from those of the people of China, or even of Paris. We use a great deal of water here. They do not consider it necessary to wash their faces every morning. In China they get along with very little water. Our people use a great deal of water; and where does it go? They have pipes leading from their wash-bowls and bath-tubs and the kitchen-sink; and this water all empties itself into the cesspool, and there it is mixed with the washings of the water-closet. Consequently, instead of getting what the lecturer has told us in night-soil, we get a certain quantity of night-soil and a certain quantity of urine mingled with an uncertain quantity of water; and we have to pay for the water, which we do not want. There is one of the great difficulties. We have so much water mixed with it, and there is so much labor involved in the application of night-soil, that it does not pay, unless we can have a very good article, and mix it with absorbents that do not cost any thing. We haul a great deal of horse-manure from the stables, which in summer time is very dry, and mix the night-soil with that, and find our account in it. But we do not find any profit in night-soil as we get it. If the habits of our people could be so changed that they could do without water, we might be able to use night-soil with profit; or if they would keep the water they use separate from the products of their water-closets, so that the night-soil would be a pure article, it might pay us to use it: but we all know that the tendency is to use more and more water. All our towns and cities are increasing their water-supplies. It comes into the house of every man who can afford it, and into the houses of a great many who cannot afford it; and, after they have used it, the water must go somewhere. They do not take pains to keep it from the water-closet.

This is, you see, a most serious problem, and has attracted the attention of the ablest engineers in this neighborhood. It is not very long since the city of Boston voted to expend many millions to improve their drainage system. They found the nuisance which has been alluded to, and it has be-

come very troublesome. The city flats are exposed to the sun at low tide; and they are a great nuisance, owing to the deposits of the sewers upon them; and the city has been obliged to provide another drain, which is to carry all the collected sewage of Boston down to Moon Island, six miles below the wharves, at the south side of the harbor, where it is to be discharged into deep water, at great expense. It will be years before this new system can be fully carried out; but, when it is, there will be no trouble. This may seem an enormous waste, and undoubtedly it is; but the question is, whether, with the habits of our people, we can do any better. Can we devise any plan by which this waste can be avoided? The engineers who have had this matter in charge do not think it can be done. They do not think we can produce such a change in the habits of our people, that this refuse matter can be made available, and put into practicable shape. There is a great deal of valuable material in our sewers; but it is so diluted with water, that the expense of moving it to the country to use it for the purpose of irrigation would be very large, and it is thought that that plan would not be practicable. A commission was recently appointed in Boston to investigate this subject, consisting of two engineers, both very able men; and they went into the matter very deeply, and took pains to investigate the disposition that is made of sewage in England, France, Belgium, and other countries. They found, that, in a large majority of cases where irrigation with sewage had been attempted, it was not profitable; that the money expended did not reap any interest; that the farms were improved, but they were improved at an expense that was not warranted by the result. There are some exceptions to this, however, as was mentioned in the lecture. The neighborhood of Edinburgh has been benefited in a money point of view; but the effect there is bad. There are one or two cases where the land is so situated as to receive the contents of the cesspools without pumping, so that the expense of raising this vast bulk of water is not required; and, in these cases, the use of this material for irrigation has proved profitable. The only practicable way of getting at the trouble seems to be to carry the sewage out a sufficient distance by a pipe, where it will not be any great trouble.

The matter of the use of artificial fertilizers has been

alluded to. I have a few words to say upon that. I cultivate a few acres of meadow-land, where I raise early potatoes for the market. I try to get them early; and I have found them a very profitable crop. I have tried fertilizers on that drained meadow, which is rather peaty, with very great success. Three years ago I manured the land with horse-manure, ten or twelve cords to the acre; and I got a very good crop of potatoes, I should think two hundred and fifty or three hundred bushels to the acre; but, before I could dig them, the rot struck them, so that I did not dig them all.

I planted the same land the next year with potatoes again, and there was fertility enough in the land to carry the crop without any additional manure. I think we dug about two hundred and fifty bushels to the acre without any manure applied. That was last year. This year I planted the same land again with potatoes. I did not dare to trust it without any manure; and, as I was short of horse-manure, I applied the Stockbridge Fertilizer by spreading it on the land, and harrowing it in; and I got very nearly as good a crop as I did last year, and a very good quality of potatoes. My potatoes came off so early, that I concluded to plant cabbages. I got the potatoes off about the 15th of July, and immediately bought the Stockbridge Fertilizer for Cabbage for one acre; and on that land I set late cabbages. I thought I was going to have a pretty good crop of cabbage; but — for some reason which I cannot explain, but which I hope will be explained by some scientific man — the well-known disease, club-foot, struck the field, and I had no cabbages fit to carry to market. I did not attribute it to the fertilizer, for I think it is a good thing; and I shall apply it again.

Mr. MURRAY of Waltham. About the year 1836 or 1837 a company was formed for the purpose of converting the sewage of New York into poudrette. I read the circulars that they sent out all over the country; and, according to their statements, the results from the use of this poudrette were perfectly enormous. I was fool enough to believe all I read; and I sent to the company, and bought a hundred barrels. It was brought to Boston in a packet-ship; and I sent teams in to bring it out to Waltham. I tried that poudrette upon various crops, both of the farm and garden, and

watched the result carefully. I am sorry to say, I put nothing but sand on the land: it was perfectly useless in every sense of the word. I compared it with the night-soil that I bought from the man who cleans the vaults in Boston; and I tried it as a top-dressing on grass and with hoed crops. I had three barrels left over; and, when the spring of the following year came, I told the men to haul it out, and throw it anywhere to get it out of the way: it was perfectly useless. They rolled the barrels out; and I told them to knock their heads in, and put the material anywhere in the road. Afterwards I wrote a short article for "The Ploughman," and condemned the poudrette in such a way, that it set everybody laughing. The article got into the hands of the manufacturers in New York; and they threatened to sue me. Well, I didn't like to be sued: so I took the letter in to my friend Charles A. Welch, of the firm of Sohier and Welch. Mr. Welch read the letter, laughed, and said, "Keep yourself perfectly easy: they will never trouble you; they are trying to frighten you." Well, as Mr. Welch said, they never did trouble me; and I have continued to advise everybody to let it alone as a thing of no value whatever.

But I have used the common night-soil brought from the city, which I have prepared with great care. I have invariably mixed it with either loam or muck, well pulverized, and exposed to the atmosphere for one or two years before I used it as an absorbent for night-soil. I prepared a basin for the night-soil, and threw this in, and threw a good coating of plaster over it; then I turned it over twice before I tried its temperature. I usually put stakes into the pile in various places to find when it was fermented; and whenever I found, by placing a thermometer in the pile, that the temperature rose over seventy-five degrees, Fahrenheit, I immediately spread out the pile, and added more of the raw material, such as muck and peat, to prevent the escape of the gases. At the same time, I always threw quite a large quantity of plaster over the pile to prevent any escape of the ammonia. I have had great success in using night-soil prepared in that way upon various crops; and I deem it one of the most valuable manures we have; but I do not approve of using it in a raw state; I want to have it always carefully fermented before I use it.

Now, since I am a mere village farmer, with a small place on the banks of Charles River, my vault is constructed with great care, so that not a drop of the liquid can escape. There is an eight-inch brick wall laid in cement; and the bottom of the vault is plastered with cement. That was done in 1859; and, when I had the vault cleaned out this fall, it was just as perfect as when it was first made. Every drop of urine from the chambers is carefully saved; and I always tell my family to be very careful with the wash-basins, so that a large quantity of water is not put down into the vault. I have a small pile of about a cord that I prepared this year: it has been well fermented. I buy one or two loads of muck; I save all my leaves around the trees; and I add about a cart-load of fine decomposed leaf-mould that I mixed with the contents of my vault this season. I pronounce it the most valuable manure that a farmer can use, if he takes a little time and trouble with it; but do not go to the poudrette man, unless you want to throw your money away.

Professor STOCKBRIDGE of Amherst. I attended this meeting for the sake of hearing the essay which has been read. The subject which has been brought before you, I deem to be one of the most important that can be presented to the farmers of the older States of the Union. But I believe, that, in relation to it, the work being done to-day is only preparatory. You may talk poudrette, you may talk night-soil, you may talk compost; but, after all, it is going to amount to nothing, in my judgment, for many years to come. We only want to-day to be thoroughly instructed upon the subject of utilizing this material; and, when the necessity comes upon us, we shall know exactly what to do with it, and so utilize and save it all.

Now, as a matter of necessity with me, the subject of night-soil is always considered at considerable length in the course of lectures at the college on the subject of manure; and I will state in as few words as I can, and as near as I can remember, the statements which I have made there in relation to it. First, it is the crying sin and shame of all the old States of the Union that this material should be any longer allowed to go to waste. Our farms are running out, and in a measure exhausted, simply and solely because we

deport from them their choicest elements of fertility in the form of food, and then send those elements down our sewers into the sea. We never can keep our farms up in the future, unless we contrive some way to utilize this material. We cannot utilize it, in my judgment, by the systems of sewerage which have been adopted in all our large cities. The gentleman who spoke upon that topic has the bull squarely by the horns. We mix two hundred, three hundred, or five hundred parts of water with one part of this choice material; and we cannot afford to take all that water, and transport it back to our farms. Therefore we have got to go straight down to the very foundation-stone of this matter. If we ever do utilize this material, as we shall in the future, we have got to change radically our system of sewerage. This material has got to be treated in our cities precisely as the other garbage is treated. If you can control one thing, you can the other. Night-soil is not the only nuisance in our cities, because every thing else gathers there that breeds pestilence, fevers, and plague. The city authorities contrive to abate that nuisance. How do they do it? They compel every man to keep a barrel or other receptacle for this garbage, and they send their teams around every day to cart it away. It seems to me that what we want is to change the system of sewerage; turn the water used for washing where it should go, into the sewer; and then the night-soil should be deodorized, either by chemical compounds or dry earth. Then it becomes inoffensive, and it can be thrown into the garbage barrels, and be carried into the country and utilized.

That is my view about it. Of course I know nothing about it, — it is all theory; but I see no other way by which we can utilize this material in the cities. But in the country, among the farmers of the country, any man who allows this material to go to waste to breed fever in his family or his neighborhood ought to be indicted by the grand jury. There is no reason under the sun why farmers should not save all this material in such a way that it should be inoffensive; but in the cities some other means must be adopted. Now, I must say another word, for the sake of calling out Dr. Goessmann, or some other man who knows his P's and Q's about this matter. Professor Atwater of Middletown told me that night-soil which had been saved in earth-closets

did not contain any fertilizing material whatever. He said you might use the dry earth over a dozen times in one of those earth-closets, taking it out, drying it, and putting it back; and the chemical analysis made by him in his own laboratory showed that it did not contain one single particle of fertilizing matter. I told him I did not know but he was right; but, if he was, it seemed to me that I was a fool. I do not believe it; for if decomposition had taken place, and all the nitrogen was lost by the decomposition, where were the phosphoric acid and potash, in which this material is extremely rich? Are they not there? Dr. Goessmann knows about this. I do not know that he has ever had an opportunity to analyze any material taken from one of these earth-closets after it had been used over and over again; but I would like to know, from his stand-point as a scientific chemist, if such a thing is possible. If this is so, let it run into the sea; for there is no fertilizing material in it. It seems to me incredible; but yet some wonderful things take place in these modern days.

Professor GOESSMANN. I believe that Professor Atwater's statement is rather too sweeping. The changes which take place in nitrogenous matters are carefully studied by most chemists engaged in agricultural chemistry. We know that nitrogenous matters decompose in two directions. Under the influence of either mineral constituents, or the free access of air, it becomes nitric acid; but under the exclusion of air, or the limited exclusion of air and the exclusion of mineral matter, it forms ammonia, and the ammonia itself, in the course of time, will change into nitric acid. Nitric acid is a substance which behaves quite differently from ammonia, so far as its relation to the soil is concerned. Ammonia is readily retained in the surface-portion of the soil, and the absorptive qualities of the soil are strong in that direction; but nitric acid passes on: therefore a waste of nitrogen might take place by passing into the lower portion of these deposits. This may explain, to some extent, the small amount of nitrogen in the surface portion of this mass. So far as the mineral matters are concerned, they cannot disappear; they must remain: there is no question about that. The deterioration of the night-soil is merely a transformation. You want to understand the character of your fertilizers in order

to know how to apply them to the best advantage. I would advise the exposure of night-soil to the air, mixed with mineral matter. I would apply it to the surface as a top-dressing, depending upon the moisture of the atmosphere to carry it speedily down. I would incorporate it with the soil, and give it time to decompose, and change its peculiar features, because, in the form of ammonia, it will be latent, and therefore cannot reach most of the agricultural crops which grow on the surface-portion of the land. Of course, non-fermented night-soil I would apply only in the case of very porous soil, which would allow the nitrogen time to gradually decompose, which is essential for its action. Plants do not live on the nitrogenous substances as they are in night-soil, but upon the final products of decomposition; that is, ammonia and nitric acid.

Mr. STOCKWELL of Sutton. This subject of fertilizers is a vital one to the farmers of Massachusetts; and the subject which comes most prominently before the farmers to-day is the fertilizers prepared under the formulas of Professor Stockbridge, because his name is attached to them, and we suppose he keeps careful watch to see that no imposition is practised upon the farmers. The farmers of our vicinity used these fertilizers to a large extent last year. They were satisfied with the results, and more than satisfied; they thought they had got hold of the right thing. And the results from the town coming before the Club, they have used a great deal more of these same fertilizers this present year, but, I am sorry to say, without satisfactory results. We do not know what to attribute it to; but there seems to be something significant in the fact that this is the universal result. With the exception of one of the formulas, which is applied as a top-dressing to grass-lands, which is prepared by Mr. Bowker, and has given satisfactory results, all the formulas have proved unsuccessful. We naturally look to find what we should expect from the fertilizers, and what guaranties we have that they are prepared properly, and that we have our money's worth. In looking at Mr. Bowker's circular we read: —

"The formulas by which these manures are made call for a stated quantity of nitrogen, potash, phosphoric acid, &c., which are never obtained pure in commerce for agricultural

purposes, but always from crude materials, like ammonia-salts, muriate of potash, dissolved bone, &c., varying in strength; and hence, to furnish the number of pounds of plant-food called for in the formulas, the gross weight of the crude material used must vary in its strength. For example, the potash which we use sometimes tests eighty per cent in strength, then again forty per cent, requiring, accordingly, twice as much in the latter case as in the former to furnish a given amount of actual potash." Then the *amount* of fertilizers that we buy is no guaranty.

"The materials which we use vary in color: therefore the compounded manures will vary. Then we are sometimes obliged to substitute a white substance, like ammonia-salts, to furnish nitrogen for a dark red one, like dried blood. So much for color." No guaranty there.

"WHAT WE GUARANTEE.

"We guarantee to furnish, as the tags show accompanying each package, the amount of plant-food called for in Professor Stockbridge's Formulas, in the right form for each crop; and here ends our responsibility. We *do not* guarantee that they will produce such and such results; for we cannot regulate the weather, or cultivation, nor guarantee against insect pests, or poor seed. These take an important part: however, under average conditions, the Stockbridge Manures will produce most satisfactory results."

No guaranty there. Then, under the heading "Protection to Farmers," we find this:—

"In using these manures it is absolutely essential that the right ingredients are obtained, properly and honestly compounded; or else failure may attend their use. As a necessary measure of protection, and that the farmers may be enabled to obtain these manures compounded in the right proportions, or the substances in proper form and purity, for home mixing, Professor Stockbridge has authorized *us as the only parties in the country to furnish them under his patent*, which he has obtained for his own protection and the protection of the public, and we are under written bonds to faithfully and honestly perform our trust. This, together with a written guaranty, which we are willing to furnish with each sale, and the Massachusetts law, ought and no doubt will insure the confidence of all purchasers."

We find a very slight guaranty there.

"OUR PRINCIPLE.

"We state what we sell, and sell what we state. A guaranteed analysis accompanies each package."

I came hastily from home, and am not prepared, as I should have been, with statistics from our farmers, or statements from them, showing the results which have disappointed them. But, going into an agricultural store here in your town, I inquired if I could find one of those little tags with the analysis of the manure. "Certainly;" and they handed me a quantity of them. They had, I should think, a four-quart dish full of them. I presume they use them properly: I have no reason to doubt it. But still it seemed to me a strange idea, that these tags should be spread broadcast through New England, to be tacked on to any thing that a dishonest man might apply them to.

Now, as to the analysis,—"five to eight per cent of nitrogen." That is a large lee-way. "Six to eight per cent of potash." That is rather a large lee-way. "Two to four per cent soluble phosphoric acid." A large lee-way (fifty per cent) there. Where is the farmer guaranteed? Now, I wish to ask the gentleman who compounds these fertilizers—Mr. Bowker or Professor Stockbridge—if he claims or believes that this complies with the law of Massachusetts. I intended to have brought in the law, and to have read it to you; but you all know it, and especially the gentlemen interested. I wish to ask, if, upon a fair interpretation of the law, this statement complies with it, or comes anywhere near it. I believe that question can be answered in but one way.

I will give one fact which came under my own observation. A wealthy man who farms a little, for the amusement of it, bought the fertilizer for potatoes, and sowed it on a quarter of an acre broadcast, as it was to be sown. The potato-beetle frightened him; and he planted one half of it to corn, and the other half to potatoes. The fertilizer for potatoes gave him a very excellent crop of corn. I do not think that any of our corn-crops raised on the fertilizer prepared for corn equalled, or exceeded at any rate, the crop raised on this piece of land manured with the potato-fertilizer as put up by Mr. Bowker. The potatoes were small, and few in

the hill, and did not pay for the cultivation. It was not owing to carelessness. They were not planted so late as to be worthless; and the land was properly prepared. No weeds were allowed; no bugs were allowed: every thing was in tip-top shape. This same gentleman had a piece of worn-out garden ground, upon which he used some of Bradley's Fertilizer, and there he raised large and fine potatoes. Now, there was something wrong about the putting up of that Stockbridge Fertilizer.

I want to say here in explanation, at once, that, from the results of last year, we have perfect faith in Professor Stockbridge. Those results were sufficient evidence that he has got hold of the right thing for the farmers of Massachusetts. We only want to be sure that we have that, and we do not feel sure. Another reason that leads us to doubt is this: we had a very valuable fertilizer in the Brighton Fertilizer, which we could buy for thirty-five dollars a ton; and its value by analysis, I think, was fifty-nine dollars per ton. Mr. Bowker bought up that fertilizer, and manufactures Professor Stockbridge's Fertilizer right there; and, if the farmers want that fertilizer, they have got to pay forty-five dollars a ton. Was that done in the interests of the agriculture of Massachusetts? It seems to me not. I hope this question will be answered, — whether this analysis fills the law of Massachusetts, — and the other question which I have just asked.

Mr. Hutchinson of Sutton. The farmers of Sutton bought, I think, this present season, something over a thousand dollars' worth of Professor Stockbridge's Fertilizers; and, gentlemen, it is no small item for our smaller agricultural towns to pay out money like that, unless they get it returned. My friend Stockwell knows more about this subject, perhaps, than I do. Our Farmers' Club was to have met last evening; and this was to have been the subject of reports from the farmers, in regard to the use of the manures. I have not heard the results so fully as he has. I can say for myself, that I used three different formulas on a small scale for my own satisfaction and my neighbors'. The result of top-dressing was such that I shall continue it, I think. On strong grass-land it was very good indeed, where it was applied according to the directions. The success on corn was only medium. I seeded down a piece with the formula this fall,

which looks well now. I shall have to report, of course, in regard to that another year.

But, sir, as has been said, this is a most important matter, and one which affects all of us. We must have something to enrich our land with, or else we have got to go by the board. The question has been up the last year or two, whether farming is profitable. I believe it is profitable if it is managed right, It is the most pleasant occupation in which men engage, and affords the surest means of livelihood; and we want to have it stand on the same basis with other business. No man thinks of going to farming to make money, as times have been for years back. I say we must have something to enrich our land. Now, as I have understood from the professor here, there was a guaranty from Mr. Bowker in regard to this manure, that it should be up to such a standard; and what we want to know is, whether, when this manure is put upon the market, it is what he has pledged himself to give us. We have faith in this manure. We hope it is something that is going to benefit Massachusetts; but we want to be sure that we get the pure thing.

Mr. Slade of Somerset. I did not intend to say any thing at this meeting, but came expressly to listen to what might be said by others. I will acknowledge that I am a little selfish in rising to ask a question which does not seem to be fully solved, and that is in relation to night-soil. A great many years ago, I used quite a quantity of it in a crude state; and the result was such as to discourage me from ever using any more in that condition. A few years afterwards, a manufacturing company in our place offered me quite a quantity, which I refused to take. But they told me that it was deodorized, that it was composted with lime, and they would give it to me if I would remove it. I went and looked at it, and found it could be done very easily. It had been accumulating there I think for four years; and they had taken the precaution to throw in lime, perhaps every day or every week, so that it could be removed without any difficulty at all. My man went and examined it and said, "Yes, by all means take it." He took the team, and drew it home. I think he had twenty-two ox-cart loads. There were some hundred and fifty men there at the works, and this was in a good state. He carted it home, as I say, and put it in a

heap by itself. In the month of October it was covered up nicely with sods; and the next spring I put it on a piece of corn. The corn came up very nicely, and looked very well until about the middle of June; and at that time the virtue of the fertilizer was all gone. The corn-crop was nothing. I do honestly believe that that corn-crop was not as good as it would have been if it had been planted without any fertilizer whatever. When Professor Atwater was quoted, that experience came into my mind very strongly. I have had an offer of the same material since, and can have it to-day, if I would take it and cart it home; but I do not think it would pay for carting. There is a reason for that, undoubtedly; and I should like to have it explained.

While I have the floor, I will say a word or two in regard to the Stockbridge Fertilizers. I have used them somewhat myself; but I have attributed the result — that is, where they were not successful — to my own fault, or a difference in soil. A neighbor of mine used some on corn this last year, and harvested seventy-five or eighty bushels to the acre, without any other manure. Other farmers have used it without satisfactory results. I used some myself on grass, and I do not think it was worth a quarter of a cent a pound. A neighbor purchased a little for grass, and a little to put on to asparagus. His hired man, in his ignorance, made the mistake of putting the dressing for grass on the asparagus; and the other he put on the grass-land. The grass fertilizer that was put on the asparagus produced an excellent crop: the other was apparently worthless. I had a piece of clover which grew after rye, — a piece that had not been manured for two years, — and my intention was to turn the clover in, and put in the Stockbridge Formula, and raise a premium crop of corn. The clover was ploughed in about eight inches deep; and I thought I would harrow it over before I sowed the fertilizer, and then harrow that in; but, upon examining it, I found that a Share's harrow had no effect upon it at all. The surface was a complete mass of clover-roots; and so I managed to furrow it out a little, and planted it to corn, thinking perhaps I would apply the fertilizer in June. The corn came up, and looked very well, and, when it was time to apply the fertilizer, I was very busy about something else, and, as the corn looked as well as

my neighbor's corn, I finally concluded I would not apply any fertilizer at all, and did not. I had an enormous growth of stalks; and I harvested a hundred and eighty-two honest bushel-baskets full of ears. I could not help thinking if I had only applied the Stockbridge Fertilizer, or some other fertilizer, to that field, what an excellent testimonial I could have furnished for another year, and I was almost sorry I had not done it. But, nevertheless, I do honestly believe that we are on the right track in regard to fertilizers; still I have not had such results from them as I think I am entitled to. I used the formula for corn year before last; but the season was so dry, of course I could not tell any thing about it. This year I used another formula on the same piece, and of course I got more corn, because the season was a better season; but still I did not get any thing like what was predicted by Mr. Bowker. Perhaps, however, the fault was mine.

I would like to have this matter settled in regard to night-soil, because I am very much interested.

Mr. Murray. Will the gentleman please state whether the night-soil had any ferment?

Mr. Slade. Not a particle. This is an important matter to me, because I am carting my manure from Fall River, a distance of five miles; and am paying five dollars a cord for it. If I can have manure given to me, within two hundred rods of my farm, that is worth any thing, I want to know it.

Mr. Capen of Boston. The farmers of Massachusetts are practical men. They are not men to have wool pulled over their eyes. They are men who know that dung is *dung* the world over, as long as it holds its qualities. I will bet every time that the Stockbridge Fertilizers are reliable. There will be exceptional cases; there will be mistakes made; there will be conditions of soil, &c., which will be unfavorable. But do not allow yourselves to be hoodwinked and bamboozled by anybody in the interests of the city of Boston, which does not want to be disturbed in its disposition of the sewage before it is absolutely necessary. They hope to get through this generation without having that subject disturbed much; but the method which they have adopted there now will prove an ignominious failure. I was very

sorry to see, two or three years ago, when one of the scientific societies of Massachusetts applied to the Legislature for a scientific survey, that they began with the statement that Massachusetts never could become an agricultural State. Now, mark that, farmers of Massachusetts, — Massachusetts can never become an agricultural State. Why? The reasons have been given over and over again at this convention. The intelligent and well-informed secretary of the Board, in his lecture on grasses yesterday afternoon, stated over and over again clearly the reasons why, — because our pastures were impoverished and made sterile, and their good qualities carried off, and converted into vegetables and meats, and then carried to the city, and converted into human beings.

That is true: it struck the nail on the head. All these things go to make men; and then the refuse is what I call excrement. Now, does any man undertake to say that that material is of no value? Then barnyard-manure is of no value. The excrement of cattle is of no value, if the excrement of men is of no value. It is all idle to talk in this way. Do not allow yourselves to be deceived by these exceptional cases. I am sorry to say, that with the intelligence we ought to expect to find in Massachusetts, and in the city of Boston, no protest has been sent to the city against the new sewer which they propose to build at an enormous expense, — not even from our Board of Agriculture, not even from the Agricultural College. That protest must come. You must make your appeal to the Legislature: you must take hold of the subject first.

Now, what ought the city of Boston to have done? Instead of making an appropriation of forty thousand dollars for a survey, they should have offered premiums to the chemists for the best method of chemical management of night-soil and sewage, and also prizes for the best mechanical method of working and disposing of it. Dr. Loring, at the last meeting, hit the nail on the head in two or three words, and with the clearest ring of truth; but he condensed it in so few words, that I hardly think it was felt. "The farmers of New England," said he, "want a fertilizer of the right kind, and they want it cheap; and they have not got it." And then what did he say? "The chemists must give it to us." That is it. It is the work of the chemist. Chemistry

is an indispensable science to the farmer. Instead of appropriating forty thousand dollars for a survey of five miles for a sewer which will be abandoned after five or six millions, perhaps, have been spent upon it, they should have offered that money in premiums to chemists. You all know how expensive chemical experiments are. Our scientific professors are poor men; the colleges are poor; they have no means for providing the material to carry on very expensive experiments: and, when forty thousand dollars are to be appropriated in a matter of this vast importance, here is a direction in which the money can be put to a good use. The science of chemistry is entitled to take charge of this question, because it belongs to that science. The city of Boston spends an immense amount of money to procure an amount of water sufficient to carry off these solids. What is the true course? Save the solids separately. The simplest thing in the world. Almighty God has so organized every animal, that the solids can be separated from the fluids where it is necessary. It is not necessary in the barn-yard. Gentlemen, I feel assured, by the intelligent faces I see here, that the farmers of Massachusetts will be true to themselves and their interests, and to the agriculture of Massachusetts and New England.

Mr. HARLOW of Shrewsbury. I would not say a word at this time, had it not been that some remarks have been made here which I feel are calculated to mislead some of this audience in regard to fertilizers. I regard this subject as one of immense importance to the farmers of Massachusetts. I have been looking around for years since I commenced farming, hoping to strike upon some fertilizer that would extend my stock of manure, so that I could accomplish more upon my farm. This, I believe, is the experience of all farmers in Massachusetts. I have felt, that, whenever a man invented any thing that could grow crops, that man was worthy of the gratitude and thanks of mankind. Now when I learned of the Stockbridge Fertilizers, — having been cheated in trying fertilizers before, or, at least, having found they did not work to my satisfaction, did not give me an equivalent for my money, — I thought I would give the Stockbridge Fertilizers a fair trial. Two years since, I purchased a small quantity of one of the fertilizers, and tried it to my

satisfaction. One other gentleman in my town also tried it, and it was satisfactory to him. During the winter I procured the services of Professor Stockbridge to come to Shrewsbury, and address the people upon the subject; and as the result of his explanation of the fertilizers, and the efforts that were made, there was a large quantity sold in our town during the past year, — more than five thousand dollars' worth certainly. I purchased myself what I paid a hundred and ten or a hundred and twelve dollars for. I applied it to corn and to Hungarian grass; and the result was more than satisfactory. I have heard a large number of the gentlemen who used the fertilizer in our town speak of it; and only two instances have I known where they have not been highly pleased with it. One of the two individuals to whom I refer applied it to a piece of ground that he raised a large quantity of turnips upon last year. He planted corn, and applied the fertilizer for corn, and it was a failure; but he said he did not attribute it to the fertilizer. Another gentleman condemned the fertilizer. He had used it on half an acre; and on the other half-acre beside it he used barnyard manure, and his corn was not worth harvesting. But he told me himself (which shows that the result was not owing to the fertilizer) that the best corn of the two was that raised on the half-acre where he applied the fertilizer. Three years ago I raised corn upon two acres and a quarter. I spread about twenty cart-loads of green manure to the acre, and I raised a good crop of corn. Last year I sowed that piece with barley, and seeded it down to grass. My grass was a failure. And this spring I ploughed the piece up again, and applied sixty-seven dollars' worth of the Stockbridge Fertilizer, and planted it with corn, and I think it was the best piece of corn ever raised in the town of Shrewsbury. It was a general topic of conversation with people who passed that way, knowing that the Stockbridge Fertilizer had been applied to it. I have been told by fifty individuals, I presume, that it was the best piece of corn they had seen this year. One old gentleman, who lives opposite me, who has been a farmer all his life (and he is now seventy years old), helped husk about three loads that I put into his barn, and he said it was the handsomest and best corn that he ever husked. I do not say that it was the largest and best yield of

corn I ever saw; but I raised over four hundred bushel-baskets of corn on the two acres and a quarter, and that I call a fair yield. On another piece of sward-land that was run out to grass, I applied thirty-three dollars' worth. There was about an acre and a quarter of it. The corn-stubble was not as large as it was on the other piece; but I had about fifty bushels to the acre. I also applied it for Hungarian grass with good results. It has been applied in our town to all kinds of crops, and, I believe, with satisfactory results.

I felt that these remarks were due to this audience after what has been said by the gentlemen who have not obtained satisfactory results. I desire, Mr. Chairman, that we may hear from Mr. Bowker, the manufacturer of that article. I feel, that, in justice to him, he should be allowed to explain the matter to this audience.

Mr. Paul of Dighton. In the meetings that I have attended I have often heard the question asked which was asked by Mr. Hersey, as to the experience of those who have used commercial fertilizers; and so far I have never heard it answered. I farm it only in a one-horse fashion, in a very small way; but I have used more commercial fertilizers than most of our smaller farmers. I have used them for some twelve or thirteen years. I live forty miles from Boston, and most all my produce goes into the Boston market. For the last eight years I have used more than seven hundred dollars' worth of manure annually on sixteen acres of land; and if I got my money back, and paid my bills, that will certainly be evidence that it pays. I do get my money back, and I pay my bills; and my land is better for it. The smaller portion of my purchases has been stable-manure. I will go over the list which I have used, accessible to the farmers of the State generally. In addition to stable-manure I have used leached and unleached ashes, which are not obtainable in all portions of the State. I have used fish-scrap, which can be obtained by any person. I have used bone after the glue-manufacturers and the soap-manufacturers have extracted the glue and the grease. That was put in crushed, in the form of bone-meal, in its raw state, except that the glue and the grease had been extracted. I have used dissolved bone, — not superphosphate, but what strictly goes under the name of dissolved bone. I have also used nitrogenous superphosphate

and Peruvian guano. I would say, that, if I had used the Peruvian guano to the exclusion of the superphosphates and the dissolved raw bone and fish-scrap, in my opinion I should have had a great many hundred dollars more in my pocket. I have used these articles on the various crops that are cultivated by our small farmers. I have raised garden vegetables to some extent, early and late cabbages, potatoes, and some hay. I have sold some years more than five hundred dollars' worth of hay from this small amount of land, a very few grapes, some strawberries, and a little asparagus. I believe that I have covered the whole ground that I have gone over, in short, and I will not take any more of your time.

Capt. MOORE of Concord. The subject as it reads on the programme is, "The management of night-soil. Discussion on manures and fertilizers to follow." Therefore, if I keep my finger out of the night-soil, and attend to the manures and fertilizers, I shall be in order, I think; and let me say, that I think I can speak advisedly on this subject, because I feel — as Mr. Philbrick does, and Mr. Rawson, and all the farmers I see about here — the want of manure. That is the question that is staring farmers in the face to-day: that is the question you have got to meet. Well, very likely my notions about this matter may not commend themselves to all present in this meeting. Some of them think, "We will use nothing but manures, strictly speaking, animal excrements:" others think "We will use nothing but fertilizers." I do not believe either one of you is right. My idea is simply this; and this is what I have practised, and what I honestly believe: if it is not right, it is fair to state it. I believe that every farmer in Massachusetts, in the first place, should save all the waste of the farm for manure he can, and buy all the manure he can get afterwards; I mean as far as his pocket and crops will warrant. After doing that, there is something more to be done. There is no doubt in my mind about one thing; and that is, that, when you apply all of these manures, you do not make the thing perfect for the crop. Again: when you apply simply stable-manure in some instances, there can be no doubt that certain crops require a large amount of some particular element of fertility — nitrogen, or potash, or phosphoric acid — over and above another crop. Now, it seems to me, it is only

sensible that the farmer, in addition to his animal manures, should supply that particular want of the crop; and, if I have ever had any success in growing crops, it has been in that direction. Now, the question will come up, If that position is right, how are you going to do it? Why, simply in this way. It does not require a great deal of knowledge; but I presume very few in this room, after all, have it. It does not require a great deal of knowledge, does not require a great deal of time, for each one of you to post himself up so that he can buy advisedly all the simple elements he wants, and apply them to these crops. Take the analyses of crops by Professor Goessmann, or the analyses that you will find in all the chemical works, which will tell you the amount of potash, for instance, that some plants want. Suppose you want to raise onions, which require potash. Why should you not add potash, when you manure for that crop, in the form of sulphate of potash? then you will not supply a large amount of other materials that the onions do not want. It seems to me it is very simple, and that the farmers of Massachusetts ought to post themselves up so that they can do it. Then, after doing that, and being able to supply those particular wants, which, as I said before, they can do, I think they will raise better crops, and I think they will be satisfied with them.

Now, it is very easy for some learned men, or some manufacturers of fertilizers, or some learned chemists (I do not mean this to apply to Professor Goessmann, because he is too modest altogether; or to Professor Stockbridge, I should add), — it is very easy, I say, for some men to undertake to prescribe for my land; but they do not know any thing about my soil: that is the point. They can tell what is good for crops; but they cannot tell half as much about my soil as I can. That is where I think farmers fail. They leave it to other men to tell them what they should know themselves about their own land, and prescribe for the land. It is their business. They have got to find the brains and the land, and the chemists and professors will tell them what they want for their crops. Then let them go to Boston, and instead of buying this mixed-up stuff, which they do not know any thing about, let them buy the materials in a form they will know, not in the form of superphosphates, not in the form of any special manures, but let them buy that particular article, and

apply it, and use their own brains in their farming, instead of keeping their brains for investing the money they make out of it. I think they will get a larger return in the end.

Now, if I have not exhausted my time, I wish to say a few words in regard to adulterations in fertilizers. As near as I can tell from Professor Goessmann's reports, the adulterations are now largely in fertilizers sold under fifteen dollars a ton, which are not covered by the law of Massachusetts, as other fertilizers are. Those manures are put on the market, and represented to be as good as a really good article. The farmers, of course, want to buy as cheap as they can; and if they can buy a fertilizer for fourteen dollars or fifteen dollars a ton, if they can be made to believe that it is as good as one that costs forty dollars or fifty dollars a ton, of course they will buy it; and they are persuaded to buy this miserable stuff.

Now, if you go to Professor Goessmann's reports, you will find that a certain man's fertilizers that are sold under fifteen dollars a ton are worth not over five dollars or six dollars, — not worth the cost of transportation to some parts of the State hardly. That is what you have got to look out for, and that is what should be brought to the attention of the Legislature. If there are any members elect here, they ought to look to it next winter, and see that the law is so amended as to cover all sorts of fertilizers. I tell you, that, if any fertilizer will not pay for the analysis, you had better not put it on the market. That is my idea about it. I do not want to call any of those fertilizers by name, that are so cheap; but, if you will go to Professor Goessmann's report, you will find one that is called "Ward's Fertilizer:" that is what Professor Goessmann calls it. I think I said, in answer to that gentleman once, that he reminded me of what a man once told me when I was a boy, and used to go gunning. He said, "John, don't waste your ammunition on any thing that is not worth shooting."

Mr. W. H. Bowker of Boston. I will occupy but a moment, as I am an interested party, and it is improper for an interested party to take up the time of this convention. The question which the gentleman raised is a fair one; and it should be met by me as the representative of a certain brand of fertilizers. In sending out fertilizers, it is impossible for us to guarantee them against the season: I think no reasonable farmer will expect of any fertilizer manufacturer, that

he shall guarantee that certain results shall be produced, regardless of the season. All the farmer can require of the manufacturer of fertilizers is, that he shall state what he sells, and sell what he states. I profess to have done that to the very letter this year.

The gentleman takes the analysis of the corn fertilizer: the Stockbridge Corn Fertilizer calls for certain stated quantities of plant-food, — a certain amount of nitrogen, a certain amount of potash, a certain amount of phosphoric acid. It is impossible for us to manufacture the fertilizer, and give a stated quantity in four bags, and have the gross weight of them uniformly the same each time. The materials which we have to use vary in strength. We cannot buy in the market one lot of one hundred tons, and have it all uniform in strength in the market: it will vary from one to five per cent in strength. Now, then, when we are to give in each bag a stated quantity of plant-food, — so many pounds of nitrogen and potash and phosphoric acid, — the gross weight in that bag necessarily must vary with the strength of the material. If any of the farmers of Sutton have got any samples of the fertilizers left, if they will send them to Dr. Goessmann, or to any responsible chemist in Massachusetts, if he does not find that the bag contained the actual plant-food called for by the Stockbridge Formula, I will pay for the test, and forfeit the thousand dollars that was paid by the town of Sutton. I will do that upon my honor. I will do it as a fertilizer manufacturer.

Now, why do we give such limits? Gentlemen, if I manufacture a bag of corn fertilizer, and it weighs in one case one hundred and fifty pounds, — as we did manufacture some that weighed only one hundred and fifty pounds, — that bag contains the same amount of plant-food as another bag which weighs two hundred pounds exactly; but the analysis which the law requires us to put on that bag of one hundred and fifty pounds must be higher. Any one of you can figure this out very easily. When it is concentrated, the test must be higher: when the material is weaker, then the test is lower. Therefore, when we speak of a variation of from five to eight per cent in nitrogen, that is to cover the variation in weight. The first year we sent out the material, and filled in the analyses with ink; but we found, that, in the rush in the busy

season, our clerks made mistakes, and it laid us open: therefore we thought, in justice to ourselves, we must put in that limit. We propose to remedy that next year. We do not propose to have that accusation brought against us again. How do we propose to do it? We propose, if we have a bag of a given fertilizer that weighs one hundred and eighty-eight pounds, to make it weigh two hundred pounds in every case. Therefore we can state an absolute test. In some cases, you will have to pay freight on two or three pounds of crude material, to bring it up; but we propose to have a stated weight for each bag, and be able to state an absolute test. If the people of Sutton had asked us for a written guaranty, we would have given them a written guaranty as to the analysis of the material which they bought in every case. And, as I have said before, if they have got any of those bags preserved, and will report at our office the letter that is on each bag, we will go over our books, and give them the exact analysis of every thing which they bought; and if Professor Goessmann does not find that the material comes up to those tests which we will give, then I will pay for the test, and forfeit a thousand dollars. It is for the interest of every manufacturer of fertilizers, and of every man who sells chemicals, if he would continue his business, to sell reliable articles.

A remark that Mr. Moore once made occurs to me. He and I have had long talks on this subject; and he said to me once, that, if I remained in the fertilizer business five years, and continued honest, I should be an exception to the rule. I have been in the business five years; and I leave it to you, and to my record in the agricultural reports, to determine whether I have been an honest dealer. I refer to those reports with pride. Gentlemen, that is all I have to say.

Mr. Ward of Bridgewater. The fertilizer that I manufacture has been referred to. The fertilizer from which that analysis was made was obtained of the chairman of this meeting (Mr. Hadwen). After seeing the analysis of that fertilizer in the Massachusetts Agricultural Report, I wrote to the chairman of the meeting, and asked him if he had any of it on hand, and if that which Professor Goessmann obtained was out of that parcel which I sold him. He said that it was, and that he had some of it left. I asked him to send me

a pound of it, and also to retain some of it himself. I received no reply to that letter. After that, within one month of the present time, I proceeded to Worcester personally, to see the gentleman, to see if he had received my letter, which I had no reason to doubt. He said that he received the letter; but, on making an examination, he found he had none of it on hand. Prior to that time, the gentleman met me in the street in Boston one day, and stated that he did not use the fertilizer which he had received, on the crops for which it was made; but, at the same time, it had produced very beneficial results.

Now, this question of fertilizers lies at the basis of the farming-interests, not only of Massachusetts and New England, but of the West, and throughout the whole country, where the sentiments of Massachusetts have prevailed, where our children have emigrated, and carried with them the same habits in regard to farming that they followed here, impoverishing the soil by a long system of cultivation. Not long since, as you all know, we raised wheat in New England; after that, wheat-cultivation was pursued in the Genesee Valley in New York, where they raised as fine wheat as was raised in the world. That time has gone by; and now we look to Minnesota, California, and other Western States, to produce the grain that we ought raise ourselves.

This question of fertilizers has not been met; and the legislators whom you send to your legislative halls are the ones to blame, and you cannot expect any thing more, unless the farmers of Massachusetts put their shoulders to the wheel, and have right, just, and proper legislation in regard to these things. I agree perfectly with what some of the gentlemen said here, — that what we want is to have proper legislation. I refer to what was said in regard to night-soil, and the sewage of the city of Boston. In the town where I reside there is a State institution, with one hundred and forty pupils. A portion of my land lies directly across the road. They wanted sewerage for those premises for all their night-soil and their washings; and they offered to build a cesspool large enough to contain the whole of it, and lay their drains, and give me the whole of it for nothing. I would not take it as a gift, and take care of it. All of you, perhaps, with scarcely an exception, may disagree with me.

But, in regard to night-soil, I will say, that where it is spread upon your gardens, if it is pure, and from healthy persons, I doubt whether it will contaminate the vegetables that you raise; but if it proceeds from unhealthy, malarious, typhoid, diphtheretic diseases, I fear it will carry the seeds of destruction, not only to your vegetables, but to the people who consume them. I know that those vegetables are not of that fine flavor, that good taste, that fine quality, that vegetables are that are raised from the chemicals. You all know, that, if you use pig-dung on your vegetables, you get vegetables that are rank, unpleasant, and of bad flavor. Carry it still farther, into your tobacco-crop, — and pig-manure is a very good article for that purpose, — but when you use that tobacco in any form, either to smoke or chew, it is so unpleasant, that even the oldest tobacco smoker or chewer will reject it in disgust.

Now, gentlemen, here is the question with me. I originally manufactured fertilizers which I put on the market for thirty dollars, forty dollars, and fifty dollars. I saw, as I went along, that the whole course of legislation in Massachusetts was founded on wrong principles. I applied to the Legislature of Massachusetts, to their agricultural committee; and I received no support from them. I was acting, I can say truthfully, honestly in the interest of agriculture. I appealed, in the address which I made at Barre, to the farmers to try a certain course of experiment, so that every man, no matter how ignorant, or how unversed he was in chemistry, or in any of the agricultural sciences, might know the facts by actual observation and experience of his own, and take no man's word for it. Every farmer should know himself, and should know by observation, by experience; and that is one great thing that is lacking in the agricultural community, that they take no observations. You take a cabbage-leaf, and one side of it will heal a sore, and the other side will keep that sore open.

In fertilizers, the law, as it now stands, requires every manufacturer of commercial fertilizers, the price of which is fifteen dollars a ton and upwards, to state how much soluble phosphoric acid there is in it, how much reverted, and how much insoluble, and from what source that insoluble comes. It also requires him to state what amount of nitrogen it

contains, and also what amount of potash, and tell who his principal agents are. That law, it seems to me, is unjust. Phosphoric acid is worth twelve cents a pound, and the manufacturer is asked how much of it is soluble. Nitrogen is worth twenty cents a pound, and nothing is said as to whether it is soluble or not. But, when your fertilizers are analyzed, you are told that there is so much nitrogen and ammonia in them; but you are not told when these changes took place, and sometimes they never take place. The secretary of the Board stated here yesterday, that, if you plant clover, the roots of that clover-crop will leave from two and a half to three tons of nitrogen and nitrogenous compounds in the soil, according to Professor Voelcker. Now, the six thousand pounds of nitrogen in that soil are worth, at twenty cents a pound, twelve hundred dollars. Is there a farmer in Massachusetts who has ever added to his soil that amount? I tell you we have much to learn.

Now, I do not propose to build up my business by saying any thing derogatory of anybody who is in the same line; for the world is wide enough for us all, and I believe we are all seeking the same good for all. The formula for the Stockbridge Fertilizers reads, so much sulphate of ammonia, so much sulphate of potash, so much soluble phosphoric acid; and, when those fertilizers are prepared in that way, they will produce good results. When manufacturers depart from that formula, and put in fish-scraps, dried blood, although they put in the same amount of nitrogen that is laid down in the formula, it appears in a different form; and they do it, I believe, because it is cheaper. But they do not produce the results that the chemicals will. There is so much nitrogen there; but you cannot tell whether any changes will take place or not. So that I say that the law does not reach the question. That is covered up.

The hour assigned to the question-box having arrived, the subject of Fertilizers was laid on the table.

QUESTION-BOX.

QUESTION. In computing farm-crops, how much of the stable-manure applied should be charged to the application of the first year, and how much in the case of fertilizers?

Mr. ELLSWORTH of Barre. I have been called upon to

answer this question. As far as I am acquainted with stable-manure, it is almost always of one kind, and I am aware that stable-manure embraces a great many different qualities. For instance, if it is finely composted, it is no more than stable-manure, and no less. If it is green manure, as we call it, unfermented, *that* is stable-manure. If these are applied to the same crops, they vary very much in their results. It is well known to these early vegetable men, that, if it is composted fine, the plants take it up very readily and very fast, while they take up the green manure very much more slowly. Probably I could talk with the gentleman who put that question, and answer it in a way that would be satisfactory; but, as it now stands, I do not know that the answer would be satisfactory. The manure that I use myself is made in my stable of good English hay and meal, sometimes a little of both Indian-meal and cotton-seed-meal, and a large sprinkling of shorts, and my hogs run upon that manure. If it was made from meadow-hay without any grain, it would be stable-manure; but I don't think it would be such manure as I make. If such manure as that is applied to a corn-crop, in my judgment the crop will use from one-third to one-half of it. It is generally thought that one-third would satisfy the crop; but I hardly think it would. Cabbages, mangels, or turnips, I think, would use very much more of the manure. Manure that is well rotted, well decayed, works quick; and I think such a crop would use up three-quarters of the manure. It seems to me it would be about in that ratio.

As to fertilizers, I should not want to give a decided opinion. I have used them in a rather cautious way; but my opinion has been, that they work quick, most of them, and that not so much is left for the after-crops, particularly the quick-working ones. Plaster of Paris and wood-ashes last longer; but the commercial fertilizers, I think, are calculated to act as stimulants for the growing crops.

While I am up, I wish to state, in regard to the Stockbridge Fertilizer, that I have used it more or less for years; not to any great extent, but enough to satisfy me that it is a good manure, and one that it would pay to use, particularly in our section. On my farm I have a very good piece of land for grass, and it has borne well. Some forty acres of

it would average two tons and a half to the acre some twelve years ago. I have managed it as well as I know how ever since. I never have sold any hay or grain, but have bought a great deal of grain; never bought any hay. But the fact is, I do not have much more than two-thirds the hay now that I used to get. I am not willing to admit that we have run down and worn out our farms; but, from causes beyond our control, we do not get anywhere near so much hay as we did formerly. My business is dairying wholly: I must have hay and grass. My pastures have suffered worse than my mowings; and it is rather up-hill business. I have always kept twenty-five cows, and still keep them by making up for the deficiency by soiling and grain. My meadows, as I said, I do not think are run out at all; but they fail to produce a satisfactory crop. Now, what shall I do? If a commercial fertilizer is good for any thing at all, it is for my use. I want to turn those sods over. I use all the manure I can near by; and then I have other mowings rather remote; and the expense of transportation is considerable. Last spring, — the last of April, or the first of May, — I turned over two acres and a quarter of that mowing-land (it had been down for seven years) eight inches deep, with a swivel plough; and, after it was all turned over one way, there was one portion of it that was a little rolling, I am sorry to say, as it proved. I applied two formulas, No. 22, of the Stockbridge Fertilizer, a formula to an acre, and there were two acres and a quarter. I felt very anxious to know what I could produce with the Stockbridge Fertilizer for making corn. I applied, as I say, a formula to each acre. I had a couple of boys with me; and they chained off the land that we ploughed up, so that we knew exactly how much we had. I ordered the fertilizer from Bowker and Company. We turned over two acres and a quarter. We chained off exactly two acres for the two formulas: the quarter of an acre had nothing. The work was all done the same day; and every precaution was taken not to let the fertilizer run over on to the quarter of an acre. On the two acres we had seventy-two bushels of shelled corn to the acre. The corn was weighed and measured. On the quarter of an acre I do not remember exactly the yield; but it was less than forty bushels to the acre. I was determined to

know whether the fertilizer was good for any thing or not, and I think it was a very good test. It was all planted alike, and every thing done at the same time, except applying the fertilizer, so that I think that paid me.

Mr. McGregor. I want to ask the gentleman a question. He states that the corn-crop will take half the amount of manure. Now, if corn will take half, what proportion will the grass-crop take?

Mr. Ellsworth. I think it will take very much less.

Mr. McGregor. How much less if you please, sir?

Mr. Ellsworth. I calculate that the rotting sod, and the barnyard-manure applied, will carry the land along eight years, and give good crops. I cannot tell what the fertilizer will do. I do not know how much of that formula is spent; but I had an idea that all of it was not used up in that crop. I intend to follow it up in that same way, and not apply any thing to the quarter of an acre, and see what the result will be.

Mr. McGregor. I did not mean this formula, but the horse-manure.

Mr. Whittaker. That is a question that no gentleman can answer, or ever will answer.

Mr. Ellsworth. I think that is the same question I did answer. I think that that rotted sod, in connection with the unspent manure, — with this green manure, as you may call it, — will give me a good grass-crop, at the rate of from a ton and a half to two tons an acre, upon my land for eight years. I think that is my experience, and I have been on the farm twenty years.

Mr. McGregor. That will make one-eighth of the strength each year?

Mr. Ellsworth. I think it will.

Mr. Paul of Dighton. Will it not take any thing from the sod?

Mr. Ellsworth. I have no doubt that it will take something from the sod.

Mr. Paul. Then it did not store up any thing like half?

Mr. Ellsworth. I don't think it did. But the manure not being composted, being green manure, I am satisfied it did not spend more than one-half on my land at that time.

Question. What kind of seed did you use?

Mr. Ellsworth. I am very glad you have brought that to my mind. I want to state that fact. I had two old gentlemen who did the husking, and I gave them directions to save the best twin-ears for seed; and I can show any gentleman thirty-eight basketfuls of twin-ears from the two acres of corn, and every ear filled out nicely. I think that is some test of the capacity of the Stockbridge Formula to make corn.

Question. What was the condition of the corn from the quarter of an acre?

Mr. Ellsworth. There were very few well-filled ears, and the fodder was very small. Every hill was looked over, so that there should not be more than four stalks in any case. There were some thirty missing hills, I was told by one of my boys. There were but thirty-one baskets of small corn on the two acres. All the rest of my corn in the granary is well filled out.

Question. Are there any kinds of commercial manures that can be used to advantage, when fresh horse-manure can be obtained, delivered on the farm, at six dollars a cord?

Dr. Fisher of Fitchburg. That is a question that I do not know much about, and I doubt if anybody does. It is a very broad question, that will take a great deal, perhaps, to answer it. It opens the whole subject of manures, and every thing else. It might be answered from a chemical stand-point; but I have no data with me, and I have nothing to refresh my recollection. I have not had any time to think of the question, because we have been talking ever since it was put into my hands. I can only give you some indication of my own opinion, from what I may call a practical stand-point. In the first place, what is meant by "fresh horse-manure at six dollars a cord"? Is it one foot of manure, and seven feet of straw, burned up at that? or is it seven feet of horse-manure without any straw? What is "horse-manure"? That is rather an important question, to be settled at the start. I suppose there is but one way to look at that practically. We buy a great many different kinds of horse-manure. Some of it is very poor, some of it very good. Was it a horse stuffed with grain? or was it a colt that was fed on meadow hay? There is a vast differ-

ence in the manure. "Horse-manure" is as indefinite as any thing can be. If you can get manure out of grain-fed horses anywhere in the State of Massachusetts, that is well cared for, and has not a superabundance of straw, at six dollars a cord, I advise you to spend all the money you have got in manure. In my region I cannot buy horse-manure at any such price; and, if I could, I don't know that I should. But still, I never knew a man to fail of getting a crop under reasonable circumstances, who put on a good charge of good horse-manure. I believe that we may say that that never fails, except when every thing fails. That is one of the conditions that will overcome a great many of the other failures in the conditions. But the question is, I suppose, Can we afford to buy any thing outside of that? Are there any commercial fertilizers that we can afford to use when we can get horse-manure at six dollars a cord? That depends upon what crops you want to grow, and upon the value of the crops. This, again, opens a vast field; and it would take a great deal of time to answer the question. I am not a farmer: I am a fruit-grower. I grow grass incidentally, but I do not grow any crops; and, looking at it from my point of view, I do not see it in my way to buy horse-manure: on the contrary, I sell hay. I sell hay at the expense of my farm, believing that I can restore, in the shape of commercial fertilizers, what I sell in the shape of hay. This is a question that has worried me a great deal in the last ten years, — "How can I keep my grass-land up to the best advantage?" I used to do it by keeping stock in the winter. I have never pastured stock in the summer: I do not believe I can afford to own a pasture. I did own a pasture once, and now it is worth a number of thousand dollars an acre. It is impossible for me to own a pasture. If it is good for any thing, I make it a good deal better; and, if it is poor, I make it a good deal better by growing it up to wood. But, after trying various experiments in keeping stock, I found that gradually I made less and less, and therefore concluded I must do something else. Then the question was, Can I keep my farm up if I sell my hay? That experiment I have been trying for a year or two, only I have not gone far enough to make it certain. I now sell all the hay that I do not necessarily use for the little stock

I keep; and I restore to my soil, in the shape of something you may call the Stockbridge Fertilizers if you please, what I think I have carried off in the shape of hay; and, so far, it has worked well. I was so well satisfied with it two years ago, that last year I applied to the whole of my farm half a formula per acre of the Stockbridge top-dressing for grass; and I am so well satisfied with it, that I think next year I shall apply the whole formula to every acre of my grass-land. I do not want to plough my grass-land up: it is expensive, and there is some risk about it. I am not attempting to grow large crops of grass: it is not my business. I am not engaged in the dairy: if I were, I should plough it up. I am endeavoring to keep it up by top-dressing. I have grass-land that has been laid down fifteen years, and it bears as good crops now as it did twelve years ago. If I can hold on, I shall be entirely satisfied. Two years' experience with the Stockbridge Fertilizers makes me think that I can. I do not say that I can; but *it makes me think that I can.* I am so far satisfied of it, that I am going to apply it more extensively hereafter.

I will not talk any more about something that I know nothing about. My specialty is fruit-growing. I have two specialties, — one is pears; the other, grapes. Now, can I afford to use horse-manure at six dollars a cord for growing grapes or pears? From my experience, I do not believe that I can; but I do believe that I can apply twenty-five dollars' worth of fertilizers, made according to formulas of my own, to either of those crops, with a great deal of profit. I concocted one two years ago, and applied it with very good results; and last year I repeated it, with slight variations, and found still better results; and I am going to do it again. I do not know that I can answer the question any more intelligently than I have done.

Adjourned to two o'clock, P.M.

Afternoon Session.

The Board met at two o'clock; and Professor W. G. Farlow of Cambridge read the following paper: —

DISEASES OF FRUIT-BEARING TREES.

BY PROFESSOR W. G. FARLOW.

No thorough knowledge of the diseases of plants can be obtained without first making a study of their microscopic structure, and of the chemical and vital relations which their different organs bear to one another. On the present occasion, however, it is out of the question to consider these points in detail. It will suffice, in this connection, to say that all plants are composed of cells, or sacs, filled with semi-fluid contents. Sometimes the cells elongate so as to form filaments, and in some cases their walls become thickened and hardened. The life of a plant lies principally in the thin-walled cells, which are spherical, or as nearly spherical as their contact with one another will permit. In studying the diseases of plants, we must always ask ourselves the question, What change has taken place in the cells themselves? for it is only by examining the changes which the individual cells have undergone, that we can, in most cases, understand the deformities and changes, which, from their size, are conspicuous even to the most careless observer.

A disease may be strictly defined as that which causes temporarily or permanently a disturbance of the function of any part of a plant or animal. The causes of disease in plants are principally insects, fungi; and to these we may add certain spontaneous changes in the plant-cells themselves. Of these three causes, without doubt the greatest harm is done by insects. Next in frequency and importance come diseases caused by fungi. Of the third class, caused by changes which arise spontaneously in the plant-cells, but little is known; and undoubtedly some of the changes to which we now give the name of spontaneous — thus conveniently covering our ignorance as to their real character — will hereafter be found to originate in some definite external cause. Whatever be the cause of a disease, whether insect or fungus, its

manifestation depends for its character, to a great extent, upon the alteration and changes in the plant-cells themselves. Now, whenever a foreign body of an irritating character, not sufficiently strong to destroy the cells at once, makes its way into a plant, the first effect on the plant-cells is to stimulate them. The cells which normally produce resin, under the irritating influence of an insect or a fungus, produce at first a greater quantity of resin; those which produce a sugary or milky juice produce it in larger quantities; those cells which arê undergoing cell-division pass through this change all the more rapidly: consequently, when a plant is attacked by insects or fungi, we usually see a swelling, owing to a more rapid increase of the plant-cells, caused by the irritation produced by the foreign body, and also an exudation arising from the undue stimulation of cells whose normal office is to secrete juices appropriated by the plant itself.

The diseases produced by insects are innumerable, but cannot be discussed by one who is not an entomologist. The diseases produced by fungi may conveniently be divided into two classes: first, TUMORS, or swellings, and BLIGHTS, or moulds. This classification is not, of course, scientific, but will serve as a basis for the present lecture. Tumors are, as you all know, of comparatively slow growth, often lasting several years: on the other hand, what are popularly called blights appear suddenly, and do their destructive work quickly. Let us start with the subject of tumors. You see before you three specimens. One is what is familiar to you all under the name of "black knot," and is growing on the branch of a cultivated plum-tree. The second specimen is on the stem of a cultivated blackberry. The third is a knot which many of you must have seen distorting the branches of hickory-trees. To the naked eye, the swellings on these different plants resemble one another very closely: the limbs affected are cracked; the surface is black and rough; and there is on the plum and blackberry more or less gummy matter exuded. If you were told that the swelling in one instance was caused by a fungus, you would naturally assign the same cause to the other tumors; but such is not the case. The swelling on the plum is caused by a fungus; that on the blackberry, it is said, by an insect; while that on the hickory has not as yet been traced either to an insect or a fungus. If the tumors,

or knots, in these three cases, resemble one another, it is not because they originated from the same cause, but because, an irritation of the plant-cells having arisen from different causes, the cells themselves, first unduly stimulated, and then exhausted, have assumed a morbid action somewhat the same in the three cases before us. Now, to the fruit-raiser, it is of the first importance to know the cause, the origin, of the diseases on his trees, because that is necessary to a thorough understanding of the reasons for adopting certain remedies, or means of preventing the spread of the disease. The origin cannot be guessed from a hasty inspection, as we see in the three tumors on plum, blackberry, and hickory. To decide the question, a microscopic examination is generally necessary, and often a long and tedious examination.

We have just said that the swelling known as the "black knot" is caused by a fungus. What is meant by a fungus? Fungi are plants of a very low organization, which are never of a grass-green color, and which are not capable of absorbing inorganic matter, and converting it into nourishment for themselves, but must take directly from other plants or animals the organic matter which has already been formed out of the inorganic materials contained in the soil and the air. All plants which are capable of changing inorganic into organic material contain a quantity of green coloring-matter known as chlorophyl, which is not found in fungi. Fungi are, in the strict sense, parasites, and, not being able of themselves to assimilate the inorganic materials about them, must appropriate it from other plants and animals as best they can: consequently any plant which has a fungus growing upon it must not only manufacture food enough for itself out of the surrounding earth and air, but enough also to support the fungus. If enough cannot be provided for both, it is the plant which must suffer, and not the fungus, which helps itself without ceremony to any organic materials which it wants. The more the fungus grows, the worse for the plant on which it is growing. Fortunately for the world, the different species of fungi do not all require the same substance for their support. Some do not grow upon living animals or vegetables, but only upon dead substances, and are useful, inasmuch as they hasten the decomposition of bodies which would otherwise slowly putrefy. The fungi which live on

dead, inert matter, are called "saprophytes," from a Greek word meaning rotten. Of course, none of the fungi of this class are the source of disease in fruit-trees. Other fungi grow upon living plants and animals, and produce many serious diseases. Of the fungi which grow upon living plants, the greater part of them are limited in their range, and do not grow indifferently upon any plant, but either upon a particular species, or on several species which are botanically nearly related. The reason for this selection of plants upon which to prey is probably that different chemical substances are necessary to the existence of the different species of fungi; and consequently they can only flourish on the plants which produce those substances. This is a matter of inference rather than observation; for we do not yet know, for example, what the chemical substance is which enables the fungus known as *Sphæria morbosa* to grow on plums, and some varieties of cherries, and produce on them the excrescence known as "black knot," while it will not grow on apples or pears. The limitation of different species of fungi to a single plant, or at least to a comparatively few plants, is a great protection to the farmer; for, were this not the case, a disease once attacking a single crop would cause a general devastation.

Not only are fungi destitute of the green coloring-matter found in the greater part of other plants, but their structure is much more simple than that of the ordinary plants with which you are most familiar. Instead of being composed of a more or less solid mass of cells packed together, as are the bricks in a house, for a great part of their existence fungi are composed only of delicate, colorless threads. When we say delicate, we must understand that the word refers only to the general appearance of the threads, and not to a lack of resisting power. If we submit the cells of the higher plants and the threads of fungi to the action of strong chemical re-agents, as caustic potash or acids, we shall find that the threads are less quickly destroyed than the cells: consequently, if we have a leaf in which a fungus is growing, we are able, on boiling it in caustic potash, to cause a separation and disintegration of the leaf-cells, while the threads of the fungus remain comparatively unaffected. The name given to the threads of the fungus taken collectively is *mycelium;* and the separate threads are called *hyphæ*, or *flocci*.

In the case of the moulds which do not grow upon living plants, the *mycelium* forms usually a mass looking more or less like cotton-wool. In those which inhabit living plants, the threads wind about amongst the cells of the plant on which they are growing, and, when seen on the surface, appear like a fine web or frost-work.

As has just been remarked, for a great part of their existence fungi consist of a mass of threads: but, under favorable circumstances, reproductive bodies known as "spores" are produced; and, in producing them, the threads undergo a variety of changes, some of which are very complicated. There are no true seeds or flowers in fungi; but in their power of germinating, and reproducing the species from which they were derived, the spores of fungi correspond to the seed of higher plants. Unfortunately for the easy understanding of the subject, the mode of production of the spores is a difficult subject to follow; and it is made more difficult by the fact that many, perhaps most, fungi produce more than one kind of spore, a state of things to which we have nothing directly corresponding in the higher plants with which we are familiar.

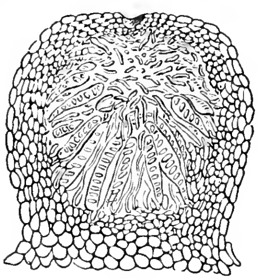


Fig. 1.

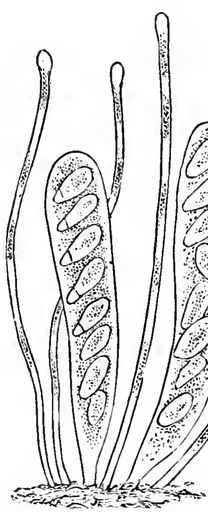


Fig. 2.

After this preliminary description of what is known as a "fungus," let us examine in detail the disease known as the "black knot." The knots are most striking in the autumn and winter. If we make a microscopic examination of a knot gathered in mid-winter, we shall find that it is composed partly of a fungus, and partly of the diseased and distorted cells of the plum-stem. The white threads of the fungus are

found twisted together in bundles (Fig. 3, *a*), which in general are parallel to one another, and run from within outwards. They extend down into the stem for a short distance below the knot, but not more than a few inches. The threads in the knot, as they come near the surface, branch more and more, and become black, and at the surface form a granular mass. The granulations can be seen with the naked eye; and, when examined under the microscope, each granulation is found to contain a cavity (Fig. 1), in which are a number of sacs intermixed with white threads. In the sacs are eight spores (Fig. 2), each of which consists of two parts, one being smaller than the other. The whole cavity opens outwards, and it is easy to see how the spores reach the air.

When spring comes, the threads which were concealed in the stem below the knot begin to grow again, and cause a new swelling just below the old knot. In a few weeks they will have grown to such an extent as to burst through the bark, and appear on the surface in spots which are green-colored, not like the color of a leaf, however, but a very dark, deep green. A microscopic examination of the greenish knots which are found late in the spring shows on the surface a number of threads, on which are borne small bodies (Fig. 3, *b*), which are also spores; and, to distinguish them from the other spores, they are called *conidial* spores. As the conidial spores ripen and fall off, we find beneath the surface the beginnings of the cavities and sacs which are to contain the winter spores. The knot grows rapidly blacker and rougher, until it assumes the appearance of the specimen before you.

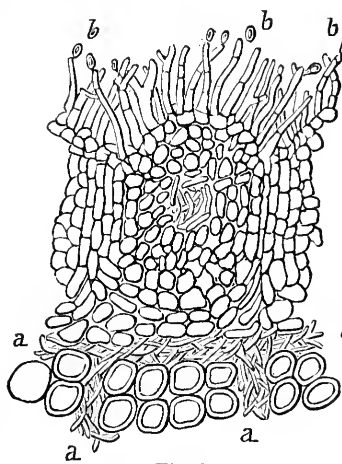


Fig. 3.

Having given as briefly as possible an account of the development of the black knot, it remains to state the conclusions which may be drawn from the knowledge obtained by means of the microscope. In the first place, we may say that the disease is caused by a fungus. Why caused? you perhaps

ask. The word "cause" is not used in natural science to signify ultimate, but proximate cause. Ultimate causes are discussed in theology and philosophy; but they do not properly fall within the scope of natural science. When we say that a disease is caused by a fungus, we simply mean that the manifestation of symptoms which we collectively call the disease is invariably preceded by the presence and growth of the fungus. To illustrate: the formation of the black knot is invariably preceded by the presence of the fungus known to botanists under the name of *Sphæria morbosa*, and the onward growth of the *mycelium* of the fungus in the healthy stem of the plum is followed without fail by the swelling and blackening characteristic of the knot. On the one hand, we never find the fungus unless accompanied by the knot. On the other, we never find the knot unless accompanied and also preceded by the fungus. If you examine the slightly swollen branches of the choke-cherry in spring, before the bark has cracked open, you will find the threads of the fungus already in the stem; and, later in the season, you will certainly find the characteristic swelling and blackening. If the fungus were only found with the knot, we could not say that it was the cause of it. As the knots grow old, there is usually a number of insects and fungi found in or on them. They cannot, however, be considered the cause of the knot, as they are found in other excrescences as well. It is because the fungus constantly precedes, as well as accompanies, the knot, that we are entitled to say that it is the cause of the knot.

Next, as to the means to be taken to prevent the spread of the disease. Our knowledge of the habits of the fungus throws light upon this point. First, we have seen that the threads of the fungus extend in the stem some inches beyond the knot itself, and these threads will, the next season, be followed by a new knot. Hence, in cutting away the knots, one should cut several inches — to be safe, we will say about ten inches — below the knots. The way the disease increases in a plant once attacked is by the onward growth of the *mycelium*. The next question is, how to prevent its spreading to other trees. The spreading is produced by the growth of the spores, one kind of which ripens, as we have seen, in midwinter, and another in early summer. The spores are all light, and easily blown about, and, when they fall upon other trees,

germinate by sending out new mycelial threads, which can enter into the stems upon which they have fallen. The object, then, should be to cut off the knots before the spores are ripe. By cutting in summer we can prevent the maturing of the winter spores; by cutting early in the spring we can prevent the ripening of the conidial spores. It is not enough, however, simply to cut off the diseased branches. If the winter spores have begun to form, they go on and ripen, even if the knots are cut from the tree, notwithstanding they may be exposed to a great degree of cold. Knowing this, we can infer that it is safer to burn all knots which are removed.

The black knot is unknown in Europe, although the European cultivated plums and cherries are botanically the same as ours. How does it happen, then, that our trees have a disease unknown in Europe? The reason is this: the fungus which causes the disease is a native of America, and grows on our wild plums and cherries. In Massachusetts it is found on the choke-cherry (*Prunus Virginiana*), the bird-cherry (*Prunus Pennsylvanica*), and the beach-plum (*Prunus maritima*). Farther west, it is also found on the wild plum (*Prunus Americana*) and on *Prunus Chicasa*. Being a native of America, when plums and cherries were introduced from Europe, the fungus grew upon them as well as upon our own wild species. Its injurious effects are better known on the cultivated plums and cherries, because, being cultivated for their fruit, they are more generally observed than the comparatively worthless wild species. All our wild cherries are not attacked by the fungus, as, for example, the rum-cherry (*Prunus serotina*); and there are a number of cultivated varieties of cherry which are not subject to the disease. In attempting to check the disease, one should not forget to remove the knots from the wild cherries growing near orchards as well as from the cultivated cherries.

Probably but few of the tumors on trees and shrubs can be said with certainty to have been caused by fungi; yet no tumor of any size is probably free from them. The number of species of fungi is enormous, and not a small proportion inhabit dead wood and bark; and the rough surface of any old tumor forms a suitable place of growth for a great many species. They are, however, not the cause of the knots, but an after-growth, and are recognized as such by those who

make a special study of fungi. Many tumors are known to be caused by insects; and, as a rule, the distortion produced arises, not so much from the attack of the insects themselves as from the effort of the plant-cells in succeeding years to perform their normal work. The injury often consists in the invasion of a leaf-bud by some very small insect; and, as a result of the irritation, the leaves constituting the bud enlarge, become hardened, and often unite into a comparatively solid mass. The next year the indurated mass itself acts as a foreign body; and there grows around it in succeeding years layers, which are all more or less distorted, until finally we have a large knot in which it is quite impossible to detect the original lesion.

In the beginning of the lecture we divided diseases caused by fungi into two general classes,—tumors and blights. The latter is by far the larger and most destructive, and more generally recognized as caused by fungi. Of course, the consideration of blights on fruit-bearing plants should not be kept distinct from that of blights on vegetables; for, in a scientific point of view, they are very closely related. To describe in detail even a small portion of the blights of cultivated plants would require several lectures; and to-day I can only call your attention to two which are common on grape-vines in Massachusetts, and let them serve as types of two large and very destructive orders of fungi. The fungi to which I refer are found as well on wild grapes as on cultivated; and neither species is as yet known to occur in Europe, although both are common throughout the Eastern United States.

You may have noticed that the leaves of many cultivated grapes are apt to look dusty after the first of August. The dustiness, if such it really were, would, of course, disappear or diminish after a heavy rain. But such is not the case. During the damp weather the dusty look increases; and, after a while, the leaf dries and shrivels. As the leaf shrivels, the dustiness disappears; and in its place we see a number of very small black bodies scattered all over both surfaces of the leaves. In some cases, instead of looking dusty, the leaves seem to be covered with a tolerably thick white web, which extends to the leaf-stalks, and in extreme cases to the grapes themselves. The blight is often supposed

to be due to *Oidium Tuckeri*, the fungus which caused formerly a great deal of injury to the grape-crop in Southern Europe, and especially in the Island of Madeira. The development of that fungus is only partly known, and there is no proof that our fungus is the same. The American fungus referred to is called *Uncinula spiralis*, and belongs to a large group of leaf-parasites, the *Perisporiaceæ*. The dusty or webby appearance of the leaves is caused by the growth of the *mycelium* over the surface. The mycelial threads, although they may cover a great part of the surface of the leaves, do not enter into their interior, except that at intervals the threads are furnished with little suckers, which just penetrate into the external cells, and serve to attach the *mycelium*. During the summer some of the threads grow up from the surface of the leaf, and at the tip divide into a

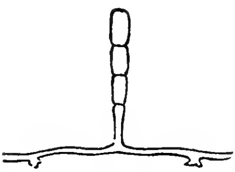


Fig. 4.

Fig. 6.

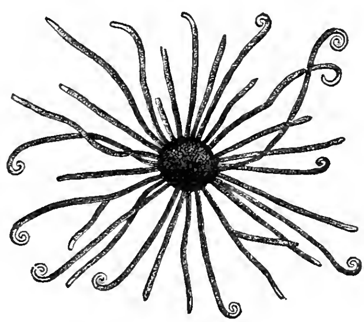


Fig. 5.

number of squarish ovoid cells (Fig. 4), which are spores corresponding to the conidial spores of the black knot. Later in the season a number of round bodies (Fig. 5) are formed on the threads. They are at first yellowish, and afterwards black. These black bodies are hollow, and contain a number of sacs (Fig. 6), in which are spores which may be said to correspond to the winter spores of the black knot. The black bodies have attached to them a number of peculiar threads or appendages, which are rolled up at the end, from which the name *Uncinula* is derived.

The second form of blight which occurs on grapes begins to appear about the same time as the first, and may be mixed with it on the leaf; or more frequently it occurs alone. The first form of blight may be found on either side of the

leaf. The second occurs only on the under surface, and appears when fresh like frost-work. The leaf-stalks are sometimes covered by the fungus; but it does not attack the grapes themselves. An examination of the frost-like spots on the under surface shows that they consist of branching threads, on whose tips are borne oval bodies (Fig. 7), which are the conidial spores. The threads do not, however, grow all over the surface of the leaf, but make their way from the interior into the air, through the holes which abound on the under surface of most leaves, and are known by the name of "breathing-pores." If we follow the threads still farther, we shall find that they penetrate through all parts of the leaf and stems, making their way between the leaf-cells. The threads are also furnished with small suckers, which push their way directly through the walls of the plant-cells into their interior. The bodies which we may call the winter spores of this blight are not found on the surface, but embedded in the leaf. They are round, and have thick walls. The name of the second form of grape-blight is *Peronospora viticola*.

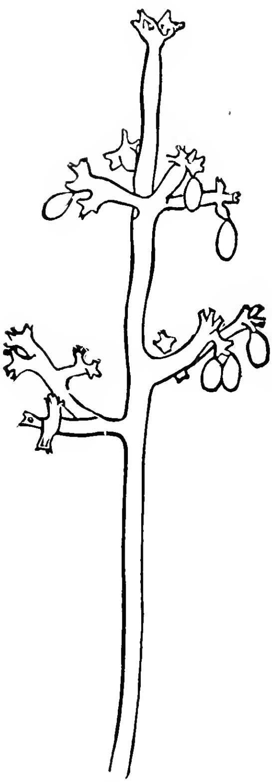


Fig. 7.

A comparative study of the two blights which we have just described is instructive. They both first appear on the leaves about the first of August, and both cause them to shrivel and drop off. One sometimes attacks the grapes, while the other does not. The two blights may be distinguished with the naked eye by an ordinary observer, as one forms a sort of dusty-looking web on any part; the other, frost-like spots on the under surface of the leaves. Both have conidial spores, which grow on stalks in the air. Both have what we may for convenience call winter spores, which ripen late in the autumn. Those of the *Uncinula* are in the

round black bodies on the surface of the leaf: those of the *Peronospora* are in the interior of the leaf.

A microscopic examination, then, shows us that it is not correct to speak of grape mildew, or blight, as a distinct disease. We have just seen that there are at least two different fungi which produce a blight; and the two differ decidedly in their habit and growth, — so much so, that the means taken to prevent the growth of one will not apply to the other. Let us consider this practical point more at length. We will suppose that the grape-raiser recognizes that his plants are attacked by the first form of blight described, — *Uncinula spiralis.* As a microscopic examination shows that the fungus is on the surface, and not in the interior, of the leaves, it is plain that the object should be to check the growth of the *mycelium* on the leaf. The injury that the *Uncinula* does to the grape is, that it covers the leaves, which in a certain sense may be said to be the respiratory organs of a plant, so that the necessary supply of light and air is shut off. The growth of the fungus may be checked by the use of sulphur strewn over the plants. We must also consider how the disease is propagated from one plant to another. The conidial spores already described are light, and easily blown from one plant to another. Wherever they fall, if the weather is only moist enough, they begin to send out threads, which form the *mycelium* of a new *Uncinula.* The threads only grow to any length, as far as we yet know, when the spores have fallen on or near grape-vines. From this we can infer that the *Uncinula* does not live entirely upon material found in the air, or accidentally on the surface of the grape-leaves, but that it also requires some peculiar substance produced only by the grape-plant. A great many of the species of fungi, however, which are botanically closely related to the *Uncinula*, are not limited to the plants of a single genus, but grow indifferently on plants which are not nearly related botanically.

Another question also arises, — How does the fungus survive the cold of winter? The conidial spores which can spread the disease rapidly are killed by the cold. The round black bodies which contain the winter spores are much tougher. The winter spores are not ripe until late in the autumn, and fall to the ground with the leaves on which

they are growing. They remain dormant during the winter, and when spring comes germinate, and make their way into the nearest grape-vines. It would not be unwise in the autumn to collect and burn all grape-leaves — that is, as far as practicable — in districts which have during the summer suffered from the *Uncinula*. In this place we should bear in mind what was said of the black knot extending from wild species to cultivated. The *Uncinula* can extend in a similar way, as it is found on wild vines; but, as far as we yet know, the fungus does not grow on any wild plants except grape-vines.

If we turn now to the *Peronospora* which grows on grape-vines, we see that the preventive measures, which in the case of the *Uncinula* would be of advantage, would here be of little avail; because the fungus is not confined to the surface, but pervades the whole plant, and, in fact, does not grow through the breathing-pores into the air until it has already traversed a considerable part of the interior of the leaves and stems. The first warning of the presence of the fungus, viz., the white spots on the under surface of the leaves, is not to be interpreted as showing that the disease is beginning, but that it is already far advanced. To sprinkle sulphur on the leaves is quite useless in the case of the *Peronospora*; for it will not affect the mass of the fungus which is in the interior. The only thing which will check the disease is to diminish the moisture in the air; but that, unfortunately, is beyond human control. If the season happens to be dry, all very well: if very wet, then the *Peronospora*, once started, will grow in spite of every thing.

The disease spreads from plant to plant during the summer by means of the conidial spores. They may be carried about by the wind and rain, just as the conidial spores of the *Uncinula*; but, when they fall on a place sufficiently moist, they germinate, but in a different way from the conidial spores of *Uncinula*. The contents of the spores separate into a number of distinct bodies, which break through one end of the spore, and escape, leaving the empty spore-wall behind. The bodies which escape, to which the name of "zoöspores" is applied, swim about by means of two hair-like threads called "cilia," which are in constant motion. Being very small, they are able to move about in the moisture which is found on the ground and on plants when it is not dry weather. They

swim about for only a short time, and then the cilia drop off, and the zoöspores come to rest. They then give off threads like the conidial spores of *Uncinula*, and the threads penetrate into the interior of the grape-plants on which they may be. Once inside, the threads constitute a *mycelium*, which extends through the plant at a rate corresponding with the external moisture; and finally the threads make their way through the breathing-pores into the air, and produce new spores. It will be seen that the conidial spores of the *Peronospora* have an advantage over those of the *Uncinula*, because they produce a number of zoöspores, generally from five to fifteen, each of which is capable, under favorable hygrometric conditions, of producing a new *mycelium* and spores. Like the corresponding bodies in *Uncinula*, the conidial spores are destroyed by cold.

The winter spores of the *Peronospora* are thick and tough, and are produced in the interior of the grape-leaves by a rather complicated process, which, although interesting from a botanical point of view, need not be described here. They fall to the ground with the leaves in the autumn, and are set free by the rotting away, during the winter and spring, of the leaves in which they are contained; and, as the season advances, they germinate, and enter the nearest vines, but the details of the germination have not yet been made out. The remarks already made about the burning of grape-leaves apply also in this connection. The *mycelium* of the *Peronospora* in the interior of the vines affected during the summer may remain dormant during the winter, and start up again when the warm weather returns. Just how much harm the *Peronospora* does to the grape-vines is not easy to decide. I have, on a previous occasion, expressed the view that it is not unlikely that the harm done has been exaggerated, because the fungus never attacks the berries, and it does not cause the leaves to shrivel and dry up until comparatively late in the summer, when, as some say, their room is better than their company; for in Massachusetts the thing to be desired is, that there shall be plenty of sunlight to ripen the grapes, which is not the case when the foliage is luxuriant, and covers up the branches. Whether the shrivelling of the leaves in the latter part of August permanently injures the vines and injures the crop is a point to be settled, not by the botanist, but empirically by the grape-

grower; and, as far as can be learned, on this point opinions differ.

My object in describing, in what you may perhaps consider too great detail, the two principal blights on American grapes, has been to show that an accurate and scientific knowledge of the causes of disease in plants requires a careful microscopic study, and that such study is not without definite and even practical results. The time has passed when the labors of botanists should be considered of interest only to special students of science. From them the farmer may learn certain facts of which he cannot afford to be ignorant. The high science of one decade, it must be remembered, becomes, in the course of three or four decades, the popular belief, and is then honored with the name of common sense, just as though, not more than half a century previously, people had not been considered fools for believing just such things. Only within a few years have fungi been recognized as the cause of disease in plants; and there is a growing tendency to account for almost all obscure plant-diseases by saying that they are caused by fungi. If a disease suddenly makes its appearance, and inquiry is made as to its cause, up jumps Dr. A., and says, "It is a fungus: I have found some mycelium." Or Professor B. startles the community with the announcement that he has found "spores." Neither Dr. A. nor Professor B. tells the public to what form the mycelium and spores belong; nor do they apparently know that it is almost impossible to find a leaf or stem in which, or on which, there are not some traces of mycelium or spores. The spores and mycelia of the common moulds are everywhere; and, if one is determined to see in fungi the cause of all diseases, he has not to look long before finding them in abundance, — such as they are. It savors decidedly of quackery to make a little bit of mycelium, or a few spores of some ordinary mould, explain the appearance of wide-spread and devastating diseases. A few years ago every thing was laid to insects by the agricultural quacks; but, as a knowledge of entomology spread, that became dangerous ground, and they then took up fungi, about which the public were not so well informed. Before long, it is to be hoped, there will be such a general knowledge of the habits of fungi, that the war-cry, "Mycelium! Spores!" will have lost its terrors. Where, then, will the quacks take

refuge? At the lowest limit of the vegetable kingdom, some would say below the lowest limits, is a large group of very minute beings, called "Bacteria." They are very small; they are found everywhere; their study taxes the *highest powers of the first scientific men.* It will be a long time before the scientific world knows much about them, and longer still before the public do. What a paradise for quacks! Without being a prophet, it will be safe to predict, that, within the next ten years, the agriculturist will have to listen to an immense amount of nonsense about the harm these small bodies do, and the diseases they cause. In the mean while, let us not underrate the harm done by fungi, while deprecating all attempts to make them responsible for every disease which may make its appearance; and here, as in other things, a little knowledge is a dangerous thing, for it is only by cautious and careful research that we reach results which are really valuable, either scientifically or for practical application.

Mr. FLINT. I find this question in the question-box: Is mildew-seed in the air, or in the land? I would like to have Professor Farlow make some statement, if he has any thing to say upon that question.

Professor FARLOW. It is in both. This fungus, you know, has two kinds of seeds, or spores. The seeds that are found on the under surface of the leaf drop off on the ground, or at least into the air, and can be carried about by the wind. The other seeds are found in the tissue of the leaves; and as the leaves fall off, and fall upon each other, of course there is quite a respectably thick layer of leaves upon the ground. These are covered by snow; the leaves rot; and these spores will be left upon or in the ground, because they will be more or less buried.

Mr. HILLS of Arlington. I proposed that question. The fact is, I have raised considerable lettuce, and I am troubled with mildew. I have noticed, that, when I went on to new lands, I was not troubled with it. I have been to considerable expense in moving my fences, so as to enclose land where lettuce had not been grown; and some men in the same business think it was foolish to do so. They say the spores are in the air.

Professor FARLOW. Some of these seeds will be killed in

the fall, and others will be left over: so, if you find lettuce-leaves affected, do not let them be, but pull them off and burn them. If you simply pull them off, these seeds will not be injured. They will come out the next spring with full force.

Mr. STRONG. The lecturer states that these spores are perishable, unless they have a sufficient amount of moisture. Now, it is known that this fruit-mildew does not prevail until about August, when we have warm weather, and very rapid generation. I would like to know how these spores live from spring until fall.

Professor FARLOW. The spores that are preserved through the winter will be those that germinate, and enter into the plants when they appear above the ground. The threads are found in the leaves and stems, from top to bottom. After a while, when they have gained sufficient force, they burst through; but they do not grow much for a time: they remain quiescent; but the next moist weather they will develop rapidly.

Mr. STRONG. You are not aware of the existence of the disease until you see these spots on the leaf. The fungus may nearly fill up a grape-vine, and not do much harm: but, the moment it has acquired force enough to break through into the air, it seems to have attained much greater vigor; and, simultaneously with breaking through on the surface, you will see a wilting and destruction of the leaves.

Professor STOCKBRIDGE. We have found an application of sulphur destructive to the fruit-mildew, when it has broken through, and becomes visible to the naked eye.

Mr. PAUL. Is there any remedy for the fungus on the grape-leaf? I am not a judge of these matters; but I will state a fact, which, by analogy, may apply to the question now under consideration. A neighbor of mine picked the leaves off of his strawberry-plants, and none of the berries ripened. I have seen on my own vines, where from some blight the leaves shrivelled and dropped off, that the grapes never matured afterwards.

Mr. FISHER. Some grape-growers have pulled the leaves from their vines to let the sun in; and the result has been exactly what any man of sense might have expected. Grapes never ripen except in the presence of the upper leaves.

QUESTION. While Professor Farlow is kind enough to answer our questions, I wish to ask him if he can give us any information in regard to the cause and prevention of pear and quince blight.

Professor FARLOW. The pear-blight has caused so much trouble throughout all the eastern portion of the country, that of course I have been asked a great many times to study it. I have examined it, and I am free to say I do not know what the cause of it is. The entomologists say they have studied it, and they cannot find out the cause. It may be caused by a fungus, or not: there is not the slightest proof that it is. Although a thousand and one fungi have been shown as the cause of it, they are all common things, that grow upon trees of various kinds; and that which is found upon every thing cannot be the cause of any special disease on a particular tree. It may not be a reproach to the entomologists that the cause has not been found. It is like a great many other things. People say, "Where are you to look for the cause of the disease?" Of course, "cause" is not used in this connection in the sense of "final cause," as in theology, but simply the *immediate* cause. Nobody has been able to find fungus growing on a limb of a pear-tree affected by blight. It ought to be the simplest matter in the world to find it if it is there. If it is caused by fungus, it is because the threads of the fungus go down the limb. Just there is the key to the whole; and no one has yet found the fungus there.

Capt. MOORE. I desire to offer at this time, for the consideration of the Board and of the meeting, the following motion: —

Voted, That the State Board of Agriculture express their sense of gratitude to the citizens of Waltham and the Waltham Farmers' Club, for their cordial reception and many courtesies, which have added so much to the success of the meetings of the Board and the pleasure of its members.

I offer this vote by the direction of the Committee of Arrangements and members of the Board whom I have consulted, because it is no more than just and due, and every word of it is true. [Applause.]

Mr. WHITTAKER. I desire to second the motion to tender

a vote of thanks to the citizens of Waltham, and particularly to the Waltham Farmers' Club, for many kind attentions which visitors here, not members of the State Board, have received at their hands. I think it is certainly due to the citizens of Waltham. I have travelled a great deal, a stranger almost everywhere; and I must say, that in all my travels, and in my visits to different parts of the world, I never met with a better state of feeling, never received so many kindnesses and so many favors, or made so many pleasant acquaintances, as I have the last three days in the town of Waltham. And, Mr. Chairman, there is nothing that I know of that gives so much satisfaction in passing through the world, where we rub against one another so hard, and frequently have the skin taken off as it were, and our feelings lacerated, and dark shadows come over us, as to remember those sunny spots which shine down upon us, and make life pleasant, and lead us to forget all those little troubles and difficulties that occur when we meet one another. I pray and trust that the farmers of Waltham, and the citizens of Waltham in general, will live, if not to treat me in the same manner as they have done, to treat in the same manner thousands who may come after me when I have done on the face of the earth.

Mr. Chairman, I second this motion because I feel that we have been so well treated. And I want also to express my satisfaction at the close of these meetings with the manner in which they have been conducted, and the large amount of information that has been presented, and the good feeling that has been manifested throughout. Last night I said that it was rarely that I attended a mass meeting of this kind, where so many came together from different parts, and so many different views were entertained in regard to different subjects, where there was so little said that any one could wish had not been said; I said then that I could not place my finger upon a sentiment that had been uttered, or any thing that had been said or done, that I would desire to have stricken out. That was a great thing to say after two days.

After some further remarks by Mr. Wetherell and others, the Chair stated that he fully concurred with the views of the gentlemen who had expressed themselves so eloquently.

The motion was then put, and carried unanimously, when the Board adjourned, *sine die.*

REPORT OF COMMISSIONERS ON CONTAGIOUS DISEASES AMONG CATTLE.

To the Honorable Senate and House of Representatives of the Commonwealth of Massachusetts.

The undersigned, Commissioners on Contagious Diseases among Cattle, are able to report that no specific disease has been prevalent in the herds of the State during the year past. The law of 1876, to prevent the recurrence of Spanish fever, by the importation of cattle direct from the plains of Texas, and the measures instituted by the commissioners to give information respecting the same, and for its enforcement, resulted that year in their exclusion, and, as was believed, with the ready acquiescence or co-operation of both cattle dealers and transporters.

The good effect of the law was so apparent, and its provisions were supposed to be so generally understood and approved, that the Board did not deem it necessary, the present year, to again call public attention to it, or warn individual parties against its infringement. But through ignorance, or intentional disregard of the enactment, sundry persons have brought small numbers of the interdicted animals within the State; though the fact was not ascertained until after they had been slaughtered, and such proof as was desirable for conviction under the law not attainable. We have reason to believe that cattle of this kind were transported by car to the Union Stock Yards in Watertown, and driven thence by public road to Brighton, because native cows driven to pasture over that route contracted and died of Spanish fever.

Texans were taken from the cars of the Boston and Albany Railroad in Worcester, and driven thence two miles to the place of slaughter; and a native herd which was driven on the same road subsequently, or grazed on a field which the Texans invaded, was attacked by this disease to the number of twenty, eleven of which died. A citizen of Upton, in Worcester County, procured a few of the same for beef; and they communicated the disease to his home stock, which resulted in the loss of eight animals.

The transactions in this class of stock during the warm season have been small indeed; but they have resulted in the loss of more than twenty choice natives, and the entire damage has been more than twenty-five hundred dollars, — a sum which, though comparatively small, should serve as a danger-signal to all interested in the cattle-trade, and stimulate the Board to be more alert in future.

Spanish fever has caused suffering and immense loss in the Western States during the summer; and for a time it was hazardous for our dealers to purchase the native animals of those States, lest they might have been exposed to the disease while in transit, and loss caused by its subsequent development. The attention of the Board was called to a case of this character. A farmer of Great Barrington, in Berkshire County, purchased a drove of cattle, natives of Ohio, and transported them to his home over the route usually taken by Texans. Most of them contracted the fever, which afterwards developed, causing the owner much loss, and creating public alarm, though the disease was confined to that herd.

The operations of this disease at the West, and our slight observation of it during the year, have served to confirm the commissioners in their oft-repeated opinion of its peculiar mode of transmission and dangerous character, and justify the legal enactments of the Legislature to prevent its introduction to the State. Of the sum of $500 appropriated by the Legislature of 1876 for the purposes of the commission, $45.35 was expended in defraying the expenses of 1875, and $62.60 was expended in 1876. The remaining sum of $392.05 by law now reverts to the general treasury. If, during the present year, an exigency should occur requiring action and expenditure by the commission, they would be powerless: therefore, as a measure of precaution and safety, they recommend to the Legislature to make a small appropriation, to be used by them in accordance with the provisions of the law.

LEVI STOCKBRIDGE,
E. F. THAYER,
Commissioners on Contagious Diseases among Cattle.

BOSTON, Jan. 5, 1878.

ANNUAL MEETING OF THE BOARD.

The Board met at the office of the secretary, in Boston, on Tuesday, the 5th of February, 1878, at twelve o'clock, Hon. Henry B. Peirce, Secretary of the Commonwealth, in the chair.

Present: Messrs. Baker, Bennett, Chadbourne, Comins, Fenn, Goessmann, Hadwen, Hawks, Hersey, Holland, Johnson, Knox, Macy, Merrill, Moore, Peirce, Sargent, A. A. Smith, Metcalf J. Smith, Upham, Vincent, Wakefield, and Wilder.

Voted, To adopt the order of business as reported last year.

The reports of delegates being in order, Mr. Macy reported upon the Essex; Mr. Merrill, upon the Middlesex South; Mr. Metcalf J. Smith, upon the Middlesex North; Dr. Wakefield, upon the Worcester North; Mr. A. A. Smith, upon the Worcester North-west; Mr. Comins, upon the Worcester South; Mr. Hawes (read by the secretary), upon the Hampshire Franklin and Hampden; Mr. Vincent, upon the Hampshire; Mr. Perry (read by the secretary), upon the Highland; Mr. Bennett, upon the Eastern Hampden; Mr. Upham, upon the Union; Mr. Baker, upon the Franklin; Mr. Perry (read by the secretary), upon the Housatonic; Mr. Hawks, upon the Worcester South-east; Mr. Fenn, upon the Plymouth; Mr. Hersey, upon the Barnstable; Mr. Knox, upon the Nantucket; and Mr. Holland, upon the Berkshire.

Voted, that Col. Wilder be requested to submit a report upon fruits and fruit-culture.

Messrs. Moore, Knox, and Merrill were constituted a committee to examine and report upon the credentials of newly elected members of the Board.

Messrs. Merrill, Hersey, and Comins were appointed a committee to consider and report upon the assignment of delegates.

Mr. Hadwen, on behalf of the Examining Committee of the Agricultural College, submitted the following report: —

ON THE MASSACHUSETTS AGRICULTURAL COLLEGE.

The committee, in conformity with the duties expected of them, have visited the State Agricultural College several times during the year. On each occasion they were fully impressed that all departments were doing well, and were being pursued, as far as would seem possible, upon sound principles, indicative of ultimate success.

If the leading object of the college and farm is to teach the student principles of practical agriculture (in which the larger portion of farmers are comparatively ignorant), with a view to perfect him for a calling vitally fundamental to the prosperity of the State; principles and practice in agriculture, whereby arduous labor will be lessened, and a higher cultivation increased, where the farm and the home, when placed under intelligent management, will develop the comforts, embellishments, and profits at once so important to induce the educated mind to pursue the calling, — then we will say the State has acted wisely and well. It must also be demonstrated to the farmer of the age, that his sons, if otherwise calculated for farmers, have greater chance for success in agricultural pursuits, by receiving a liberal as well as a practical education.

That science is absolutely indispensable to aid successful and profitable agriculture is already demonstrated, to a considerable extent, and still is receiving commendable efforts and attention in a variety of experiments.

It would seem, therefore, that one important point should be prominently kept in view; and that is the profits of the farm, either immediate or prospective: in other words, legitimate farming-operations should receive the greater, and experimental farming, less attention of the college farmer.

We are well aware that a farm under the supervision of a board of trustees (with more or less red tape) cannot be carried on with the same degree of success as by a competent individual. The opinions of farmers even are exceedingly diverse and contradictory in agriculture: while they will agree in general principles, they will differ in specialties.

Thus your committee, while they are not able to fully indorse all the operations of the farm, do not feel at liberty to criticise, but rather, in a kindly spirit to suggest.

The farm ought to be an example of high and successful agriculture. If learning and intelligence can promote agriculture, here is pre-eminently the place for practical demonstration. On our several visits we were fully impressed, that most departments of the farm were improving, and that the general management is indicative of ultimate success. The productive capacity of the farm is rapidly increasing, the acres yielding larger annual returns; unproductive lands are being renovated, and brought into profit; rough places being made smooth; the preliminary labors, with view of improvement and profit, are nearly completed; and the whole outlook of the lands is more pleasing to the eye in all aspects.

With the extensive area of the farm, it would seem that the dairy would become one of the leading interests of the farm, and one combining both instruction and profit. The best results can only be obtained by the keeping of stock bred and especially adapted for dairy products.

It may be commendable to try experiments with different breeds of cattle; but it would certainly seem that the keeping of many bulls would be conducive to a dry dairy, as well as an unnecessary expense, as no one believes that pure bred stock of the highest excellence and merit can be *bred* where several breeds are kept on one farm. The college farmer may have an opportunity to learn the hidden forces of brain impression in breeding animals where many breeds are herded together, and the trustees remain forever in ignorance. The old Romans had a proverb, "A word to the wise is sufficient."

It was exceedingly gratifying to note the fine new dairy room, a valuable adjunct to the dairy department; being a generous and much needed gift by a liberal and public-spirited gentleman of the trustees. Every thing within seemed clean and sweet; and the butter and cream had the texture and shade and color of gilt-edge, and, we were informed, find an appreciative and ready market.

The farm-crops appeared to be above those of the average farmer. A wide area is devoted to grass, which looked well in early spring; and large crops were afterward harvested.

Considerable ground is devoted to hoed crops, with satisfactory results.

A wider area is being devoted to the cultivation of those commonly termed small fruits; i.e., the strawberry, raspberry, and grape. We were glad to notice that experiments were in course of trial, intending to demonstrate what is the best plant-food for each of the different kinds: if successful, they will add important knowledge, which is much needed in their successful cultivation.

We also notice the raising from seed of forest and ornamental trees is receiving attention in the arborical department: its importance is justly conceded as a branch of knowledge and industry very important for the future thrift and welfare of farming-interests, and one well worthy of encouragement.

A former committee recommended the growing of seed of vegetables raised in market and farm gardens. There is, perhaps, no branch of agricultural industry requiring more skill, and no field where skilled labor will be better repaid. Pure bred seed is of as great importance as are pure bred animals; and, at the present time, no product is more difficult to obtain than pure seed of good and reliable strain; and it would seem to your committee that high bred seed is especially one of the products the college farm can raise, and disseminate for the advantage of all.

The conservatories and plant-houses, with the gardens connected, were well stocked with plants. Here are grown for sale many vegetable and flowering plants, which find ready market in neighboring towns. The facilities for supply thus far have not equalled the demand. A new plant-house has been erected the past year, from means furnished by one of the trustees, who seems ever ready to generously respond to the needs of the institution.

We will leave the report of the college proper to the faculty; but, as far as we are able to form an opinion from observation, we are satisfied that the Agricultural College will instruct and turn out men that can use both head and hands, — men that are pre-eminently fitted for the business relations of life, whereby agriculture will become exalted and stimulated by men trained to close and exact observation in the varied departments of rural and farming pursuits.

But, while we say this in praise of the work done, we wish to say, that, in our judgment, young men who are to be practical farmers should know thoroughly the common things around them. The students of the Agricultural College should be able to name and give a full account of all the grasses and other useful plants likely to be found on any farm. The common weeds even are worthy of the farmer's study, that he may protect himself against them. The young men in the college should know how to make property, and should have the will to protect it. Care of ground and buildings is a good preparation for successful business and good citizenship.

O. B. HADWEN,
Chairman of Committee.

The report was read, and laid over.

The following essay, having been submitted to the Boston Society of Natural History, from which it received the first Walker Prize, was offered to the Board for publication, as the best method of reaching those for whom it was designed.

A COMPLETE LIFE-HISTORY OF THE ARMY-WORM (*Leucania Unipuncta*) AND ITS PARASITES.

BY PROF. C. V. RILEY.

"*The facts are what we want.*"

Having, during the past year, ascertained certain hitherto unknown facts in the life-history of the army-worm, the author submits the following memoir on the subject, proposed for the Walker Prize for 1877, premising only that it is largely condensed from his other writings.

All accounts of this insect, previous to the year 1861, are characterized by inaccuracy and confusion. During that year, however, by the contemporaneous observations and experiments of several well-known entomologists and agricultural writers, — prominent among whom were Benjamin D. Walsh and Cyrus Thomas of Illinois, J. Kirkpatrick and J.

H. Klippart of Ohio, and Dr. Asa Fitch of New York, — the principal facts in its natural history were made known to the world, and the parent-moth identified. The remaining obscure points in its history — viz., the number of annual broods, the state in which it hibernates, and the mode, time, and place of oviposition — were first fully elucidated by the writer in 1876.

Leucania unipuncta, the progenitor of the army-worm, is a light, reddish-brown or fawn-colored moth, principally characterized by, and receiving its name from, a small but distinct white discal spot on the primaries, which have also a dusky oblique line running inwardly from their tips. This moth was first described by the English entomologist Haworth, in the year 1810, in his "Lepidoptera Britannica" (p. 174), as *Noctua unipuncta*. Subsequently the French entomologist Guenée, overlooking Haworth's description, and regarding it as a new species, named it *Leucania extranea*.

Haworth's name takes precedence. It is considered a common species in European collections, and Guenée mentions it as occurring in Brazil. A variety without the white spot is found in Java and in India; and still another — lacking the white spot, and having a dark border on the hind-wings — occurs in Australia. Specimens undistinguishable from ours have also been collected in the latter country and in New Zealand.

The sexes, at first glance, are not easily distinguished. There are no colorational differences; nor does the abdomen of the one sex differ materially in size and form from that of the other. Yet a careful examination with an ordinary lens will enable one to separate them with sufficient certainty by the smoother antennæ and more pointed abdomen of the female, compared with the more hairy or ciliate antennæ and the blunter abdomen of the male. In both sexes the tip of the abdomen is covered with a brush of long hairs; and, the moment these are brushed away, the sex is at once easily ascertained. If the tip of the abdomen of the male be denuded, by means of a little friction with a stiff camel's-hair

brush, without injuring the horny parts, we notice two rounded, horny brown lobes, or clasps, extending somewhat beyond the ultimate joint, the lobes some distance apart below, but converging until they touch above. A careful removal of the chitinous exterior of the two terminal joints will further reveal these lobes as parts of a somewhat complicated arrangement, admirably adapted for seizing the female, and consisting chiefly of the two lobes referred to, of two smaller inferior lobes, and of two intermediate organs starting from a knotty base, — the upper one curved, and ending in a sort of beak; the lower one more straight, and ending in a small cushion of contracted membrane above.

If we now take a female, and denude the tip of her abdomen in the same way, we shall find a quite different and far more simple structure; namely, a thin, vertical, blade-like valve, more or less produced or elongated on the upper portion, of a brown color, but with a broad, slightly thickened, paler border. This valve plays into two retractile subjoints of the body, and may be hidden within the terminal joint proper, so as to show only the upper tip; or it may be extended until it is fully exposed. It is, in reality, composed of two thin layers, closely appressed except at the upper or dorsal portion near the base, where it swells into a somewhat angular ridge outside, and is hollow within. A more careful examination will show that the upper portion is irregularly and obliquely striate, the striations representing folds of the membrane to facilitate expansion; and that the hind-border is garnished with fine hairs, which easily rub off, and leave the edge quite sharp, so that the two layers form a blade, which is admirably adapted to pressing in between narrow passages. In life, this ovipositor plays on the two subjoints, which may be greatly extended, and, when so extended, form a somewhat cylindrical and telescopic tube, which is rendered very firm by a series of stout muscles. By study of this structure, the writer was enabled to correctly anticipate the mode and place of oviposition, which had for so many years evaded observers.

The moths that issue during late summer and autumn hibernate, and, together with those which issue from hibernating chrysalides, oviposit as soon as vegetation starts in the spring. The eggs are thrust in between the sheath and stalk of well-

grown grasses, whether cut or standing; or occasionally in between the natural fold of the green leaf, or the unnatural curl at the sides of a withered leaf. On low blue-grass they are almost invariably laid in the fold at the base and junction of the terminal leaf with the stalk. The moth invariably endeavors to secrete them. They are generally laid in single rows of from five to twenty, and upward; and they are accompanied with a white, glistening, viscid fluid, which glues them to each other and to the plant, and, when laid in the folds of a spear, draws the two sides securely over them, leaving but a glistening streak along the more or less perfectly closed edges.

The female, having once commenced to lay, is extremely active and busy, especially during warm nights; and but a day or so is required to empty the ovaries, which have a uniform development. A string of fifteen or twenty eggs is placed in two or three minutes; and, by the end of ten more, I have known the moth to choose another leaf, and supply it with another string. The moth perishes within a day after having exhausted her supply of eggs. The egg is glistening white when first laid, smooth, and about 0.5 *mm.* in diameter, becoming tarnished or dull yellowish toward maturity. Just before the hatching of the larva, which, in a uniform temperature of seventy-five degrees Fahrenheit, takes place from the eighth to the tenth day after oviposition, the brown head of the embryo shows distinctly through the shell.

The newly-hatched larva is 1.7 *mm.* long, dull, translucent white in color, with a rather large, brown-black head. The two front pairs of pro-legs, as in many other noctuids, are so atrophied as to necessitate the looping motion in travelling. When disturbed, it instantly drops by means of a web. The development of the larva is quite irregular, but requires, on an average, only three weeks. The number of moults is normally five. After the first moult, the color becomes yellowish green, with the lines which characterize the mature larva faintly outlined in rose-brown. After the second moult, the looping habit is abandoned, and the worm curls round, and does not spin in dropping. In the fourth stage, the aspect is quite changed; the general color being dull, dark green. In the fifth and sixth stages, the characteristics of the mature larva are more and more as-

sumed. The chrysalis is normally assumed in a simple cell in the ground.

Although the travelling of the worms in large armies is generally considered one of the principal characteristics of this insect, it is nevertheless abnormal. During the latter part of April, and throughout the month of May, in latitude thirty-nine degrees, the worms may almost always be found by diligent search in moist grass-land that was not cut or grazed too closely the previous autumn. At such times they have essentially the habits of ordinary cut-worms, and are seldom noticed, unless so abundant as to cut the grass entirely down, and be obliged to migrate to fresh pastures. Indeed, one may pass daily through a grass-plat where they abound, yet never suspect their presence until the plat suddenly begins to look bare in patches.

There are two reasons why they so easily escape detection in this their normal condition. *First*, when less than half an inch long, they are not recognizable as army-worms, except to those who reared them from the egg. The characteristic dark sinuous lines on the head, and the vittæ along the body, are at this time more or less obsolete, and the general color is paler. *Second*, they feed mostly at night, and hide during the day at the base of the grass, or under any other shelter at hand. If they venture to mount to feed during the day, —which they often do in cloudy weather,—they drop at the least disturbance, and curl up in a spiral, so as to simulate very closely a small shell of the helix form. The worm loves cool, moist places, and is more often found around the margins of creeks and ponds than elsewhere. As already intimated, it is only when hunger impels them, that they vacate the fields where they are born; though, after they have once begun the wandering habit, they will often pass through fields without eating every thing to the ground. When travelling, the worm will scarcely turn aside for any thing but water, and even shallow water-courses will not always check its progress; for the advance columns will often continue to rush headlong into the water until they have sufficiently choked it up with their dead and dying bodies to enable those in the rear to pass safely over. I have also noticed, that, after crossing a bare field or road where they were exposed to the sun's rays, they would congregate in immense numbers under the first shade they reached.

The bulk of the worms are full grown, and do the greatest amount of damage, about the time that wheat is in the milk. In ordinary seasons they are reported along the thirty-second parallel, as in Texas, early in March, and about a week later with each degree of latitude as we advance northward; so that in Maine they often make their first appearance as late as September.

The worm confines its attacks to grasses and cereals; and it is extremely doubtful whether it could live for any length of time on other plants. Its more natural food-plants are the coarse swamp-grasses. Of cultivated crops it does most injury to Timothy, blue-grass meadows, and winter wheat. Though the worms will nibble at clover, they are evidently not fond of it, and generally pass it by. Rye, also, is not so palatable to them as some of the other grasses. They often cut off the ears of wheat and oats, and allow them to fall to the ground, and are doubtless led to perform this wanton trick by the succulence of the stem immediately below the ear. South of latitude forty degrees, they generally appear early enough to materially injure the crop; but north of that line wheat is generally too much ripened for their tastes, and is sometimes harvested before the full-grown worms make their appearance.

There are two facts in the history of the army-worm, which create most astonishment in the minds of those unfamiliar with its habits. These are, its sudden appearance over large stretches of country, and its equally sudden disappearance at the height of its destructive career. It is a well established fact that all army-worm years have been unusually wet, preceded by one or more exceptionally dry years. Bearing in mind that the insect is with us every year, and that its favorite abode is in low prairie-lands and swampy meadows, we can understand how, during very dry seasons, when these lands dry out to a greater extent than usual, the range of the worm is extended, and the conditions for its development particularly favorable. Should the succeeding season prove very wet about the time the moths oviposit, they would naturally be driven from all land low enough to be submerged, and forced to consign their eggs to higher grass-lands, which the copious rains would render sufficiently wet to suit their habits.

By virtue of their naturally secretive habits, and of their protective coloring, the worms in their earlier stages easily escape the eyes of man; but when the bulk of them have passed through the last moult, or in other words are nearly full-grown, and have stripped the fields in which they were born, they are obliged to migrate in bodies to new pastures. Thus assembled and exposed, they pass through grass and grain fields, devouring as they go; for they are now exceedingly voracious, and, like most lepidopterous larvæ, consume more during the last few days of worm-life than during all the rest of their existence. The farmer who is unacquainted with these facts naturally wonders at this sudden appearance; and shortly afterwards, when they enter the earth, or otherwise conceal themselves to transform, he is again puzzled at their sudden disappearance. When the worms are thus exposed in numbers, the many natural enemies of the species work far more effectively than when they have to seek individuals hidden here and there in the rank grass: hence the partial annihilation of that species that follows the advent of such large numbers. Moreover, while a certain amount of moisture is most congenial to them, excessive rains and floods, such as are likely to occur after very dry years, must inevitably tend to their destruction, floating many away into rivers, and causing others to rot on and in the ground. Man, too, in his warfare with them on such occasions, destroys great quantities. Finally, it is only the vast armies on our cultivated lands that disappear so suddenly: numbers yet remain unobserved in unfrequented and uncultivated meadows and prairies.

Whether the species produces one or more broods annually had long been a disputed question. All the facts indicate, that, over the larger part of the country in which it proves injurious, there is but one brood annually; but I have proved, that, like so many other species that are single-brooded farther north, it is double-brooded in latitude thirty-eight degrees, having succeeded in rearing one generation from the other. The second brood of worms gave me the moths early in August; and there is good evidence, that, exceptionally, a third brood may be produced the same year. Indeed, by diligent search out of doors, I have found larvæ of all sizes during the month of August, and a few full-grown individuals

as late as the 23d of September. As already stated, there is great irregularity in the development of individuals from the same parent; and there is little doubt in my mind, that, while the production of a third generation is the exception, it may in some years prove the rule.

Regarding the manner of hibernation,—whether as eggs, larva, chrysalis, or moth,—there has been great diversity of opinion among observers.

Assuming that eggs may be laid in early fall as well as in spring, the following questions must be considered: 1st, whether the eggs laid in autumn hibernate as such, or whether the larvæ first hatch, and hibernate while small; 2d, whether those laid in spring are from moths which issued at that season, after hibernating as chrysalides, or by such as issued the preceding fall, and hibernated as moths.

As bearing on the first question, it is interesting to note that the European species of the genus, so far as their habits are known, hibernate in the larva state. Quite a large proportion of our closely-allied cut-worms are also known to thus hibernate. It would seem, therefore, that, in default of direct observation, we have no good reason for assuming that the eggs laid in autumn necessarily hibernate as such; and the delicacy of the shell, and rapidity with which they hatch under moderate heat, renders their hibernation extremely improbable. But, while these analogies would indicate that the insect may possibly winter in the larva state, all the other facts point to the conclusion that the proportion that so winters, if any do, is very small. Instead of abounding in a wet spring, when their favorite haunts are overflowed, they would be well-nigh drowned out, on the hypothesis that they had been wintering there as larvæ.

As bearing on the second question, we have certain facts which indicate that some of the *pupa* hibernate, the proportion undoubtedly increasing as we go north.


The Pupa.

But the weight of evidence goes to show that the insect passes the winter principally in the perfect state, in which state alone it has actually been found in winter. From the foregoing considerations I think we may safely conclude, that—taking our whole country, with its varied climate—there is no state in which the army-worm can be said to solely pass the winter; that, ac-

cording to latitude and the character of the seasons, there is nothing to preclude its hibernating in any one of the four states of its existence; that, in the same latitude and under the same conditions, it will even hibernate in different states; and that, finally, the great bulk of them hibernate in the *pupa* and moth states, the proportion of the former increasing northward.

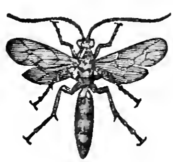
Of natural enemies the army-worm has no lack. Hogs, chickens, turkeys, small birds of various species, toads, and frogs, all feast upon it greedily whenever it appears in considerable numbers. Various predaceous beetles likewise gather around the travelling hordes, and prey savagely upon them. Ten different species have been detected by myself and others in this work. The worms have also an unusual number of true parasites. They never travel from one field to another unaccompanied by a number of tachinid flies, which are often so numerous, that their buzzing is suggestive of a swarm of bees. These are *Exorista leucaniæ* (Kirk) and *E. flavicanda* (Riley). Seizing the first opportunity to attach their eggs behind the heads of the army-worms, these flies are as persistent in their work of destruction as the worms are restless under attack. No worm carries these eggs into the ground with it, but falls a victim to the maggots hatching therefrom, and which in a very short time become flies like the parent.

Often fully eighty per cent of the worms are parasitized by these flies.

The next most common parasite of the army-worm is *Microgaster militaris* (Walsh), — a little black, braconid fly, with rufous legs. The larvae of this fly infest the worm in great numbers, and so enfeeble it, that it cannot enter the ground, but lingers, sluggish and paralyzed, on some grass or grain stalk. Presently the little parasites all issue from its body, and spin in concert a large amount of silk, in which each individual forms a neat little egg-like cocoon. *Mesochorus vilreus* (Walsh) is another braconid that attacks the army-worm. It is but slightly larger than the preceding, and may be distinguished from it by the more graceful form, and by a translucent, yellowish-white spot in the middle of the abdomen. *Pezomachus minimus* (Walsh) is a small, wingless ichneumon, which, like the *Microgaster*, spins cocoons in cot-

tony floss on the back of the worm, but places them close together in symmetrical order. In addition to these small parasites, there are a few larger ichneumon-flies that infest the worm. I have reared from it *Ophion purgatus* (Say), — a horny, yellow, slender-bodied insect with a short ovipositor. According to Dr. A. S. Packard, jun., the female attaches her bean-shaped egg by a pedicel to the skin of the worm.

The footless grub which hatches therefrom, according to the same author, does not entirely leave the egg-shell; but the last joints of the body remain attached thereto, while the larva reaches over, and gnaws into the side of the worm. The species spins a tough, brown, silken, oblong-oval cocoon. *Ichneumon leucaniæ* (Fitch) was reared from the worm by Dr. Fitch; and two other genuine ichneumons that are parasitic on it are figured in Harris's "Injurious Insects." They are shown of the natural size in the annexed cuts.



The following is a summary of the natural history of the army-worm.

The insect is with us every year. In ordinary seasons, when it is not excessively numerous, it is seldom noticed: 1st, because the moths are low, swift fliers, and nocturnal in habit; 2d, because the worms when young have protective coloring, and when mature hide during the day at the base of meadow-grass. In years of great abundance the worms are generally unnoticed during early life, and attract attention only when, from crowding too much on each other or from having exhausted the food-supply in the field in which they hatched, they are forced from necessity to migrate to fresh pastures in immense bodies. The earliest attain full growth, and commence to travel in armies, and to devastate our fields, and attract attention, about the time that winter wheat is in the milk; this period being two months later in Maine than in Southern Missouri. They soon afterwards descend into the ground, and thus suddenly disappear, to issue again, two or three weeks later, as moths. In latitude thirty-nine degrees the bulk of these moths lay eggs from which are produced a second generation of worms, which become moths again late in July, or early in August. Farther north there is but one generation annually. The

moths hibernate and oviposit soon after vegetation starts in spring. The eggs are inserted between the sheath and stalk, or secreted in the fold of a blade. Mature and perennial grasses are preferred for this purpose by the female. The worms abound in wet springs preceded by one or more very dry years. They are preyed upon by numerous enemies, which so effectually check their increase, whenever they unusually abound, that the second brood, where it occurs, is seldom noticed; and two great army-worm years have never followed each other, and are not likely to do so. They may be prevented from invading a field by judicious ditching; and the burning over of a field in winter or early spring effectually prevents their hatching in such field.

Professor Goessmann presented the following report: —

THE IMPROVEMENT OF SALT-MARSHES IN THE TOWN OF MARSHFIELD.

The increase of the area under cultivation has not been quite as marked during the past year as was anticipated at the close of the preceding season. Various circumstances have largely contributed towards that result. The wet weather during the spring kept the grounds too soft to permit an early ploughing and harrowing. The subsoil water, in consequence of frequent rains, rose considerably above the comparatively low level of the prevailing season, and injured more or less some of the crops on account of its still saline character, in particular throughout the lower portions of the marshes. In some few instances the crops failed entirely; in the majority of these cases they suffered in a sufficient degree to fall largely behind good average crops. As a large area of the lands still yields remunerative grass and grain crops by a mere harrowing of the surface, the more expensive ploughing is frequently deferred to some future season, when the more advanced disintegration of the accumulated vegetable matter shall leave no other chance for a successful cultivation than a thorough breaking-up of the spongy surface matter. As two succeeding wet seasons have kept the old sod in a better state of preservation than dry seasons would have accomplished, the necessity of ploughing the

lands for cultivation is, for the present, considered less pressing. The sickness of Mr. Thomas B. Williams, the largest owner of the marsh-lands, who has taken thus far the leadership in the more costly improvements, as deep ditching and ploughing, has caused an entire cessation of all extensive progressive improvements on his lands during the last autumn. These temporary disadvantages are, however, well understood; and it is safe to state that the general interest felt in the enterprise has been by no means checked, but is steadily increasing. Whilst it cannot be denied that many are still keeping aloof from engaging in the improvements, on account of the fear of expenses in regard to the harbor, it is not less certain that more parties have been at work upon the marshes during the past year than at any time since the dike has been built. The latter has been in very good working-order during the past year: the expenses for repairs have not exceeded twenty dollars during that time.

The opinion expressed in our previous reports, that the question of an efficient drainage ought to be considered of controlling importance, and should receive at the outset the most serious attention, is at present accepted by all, and already verified by experience. More ditching has been done than in any previous year. Wherever the drainage has been neglected, entire barrenness of the area, or a scanty growth of *everlasting*, has been the result. The recommendation of a common general system of drainage does not yet meet with that general approval which was expected, on account of the opinion of many parties, that the numerous branches of the creek favor sufficiently individual enterprise. Less lands have been ploughed in 1877 than in 1876, for reasons already explained. Two hundred and fifty acres, or about one-fifth of the reclaimed lands, are at present under cultivation, including fifty acres of ploughed lands, also lands sown on the sod, besides what has been harrowed, and subsequently sown during the past autumn. Some of the ploughed lands have produced very satisfactory crops, while others have produced but little: these failures are due to several unfavorable local circumstances. In some instances the surface was very uneven still, and covered with large pieces of a turfy material, which during the wet weather turned tough and unmanageable: the harrowing

was consequently very unsatisfactory, and the seeding very imperfect. In other instances, no proper care had been taken to support the ploughing by a previous efficient under-draining. The presence of highly saline subsoil waters, raised in consequence of rains considerably above their level during the preceding seasons, either prevented entirely the germination of the seeds, or produced a sickly vegetation. The surface mass upon some of the ploughed lands, still largely impregnated with saline waters, has become compact and hard. Much of the unploughed and well-drained lands can now be well pulverized by harrowing for the cultivation of grass and grains. Bradley's Reversible Harrow is usually used for that purpose. One of the best pieces of grass and of oats — eight acres of the former, and five acres of the latter — was raised upon lands, after simply harrowing the surface before seeding. The risks incurred by sowing directly upon the old sod, without any previous harrowing or ploughing, as circumstances may advise, is well illustrated by the fact, that, in several instances during the past summer, good hay-crops, in some cases two tons and a half per acre, have been harvested upon lands seeded down in 1875, and which showed scarcely any grass in 1876. One party raised in that way about twenty-five tons from seeds he considered lost. The ploughed lands have been chiefly used for grain and cultivated crops; the harrowed lands, for grass.

Among the grain-crops, oats and rye, and of the grasses red-top, have been the most successful crops during the past season. A careful approximate estimate of the amount of some of the leading crops grown during the past year shows the following results: —

One hundred and twenty tons of hay.

Eight hundred and thirty bushels of oats.

Three hundred and fifty bushels of rye.

Two hundred and sixty bushels of shelled corn.

Somewhat over one hundred bushels of superior potatoes: they were large and smooth. The first premium awarded to potatoes at the late Marshfield Agricultural Fair was given on those raised upon the reclaimed marsh-lands. Three-quarters of an acre produced one hundred bushels of potatoes.

Garden-crops of various descriptions have also been raised

with good success by various parties. Onions, tomatoes, asparagus, cucumbers, melons, cauliflower, cabbages, beans, pease, and sweet-corn are in particular mentioned.

One measured acre produced, in one instance, 6,800 pounds of hay; one acre of oats yielded forty-three bushels, and, in case of rye, thirty and one-half bushels. The second premium at the Plymouth-county Fair was received for that acre of rye. Hay in barn sold at twenty dollars per ton; oats at retail sold for fifty-five cents per bushel, and rye at about one dollar per bushel.

The previously stated yields of different crops per acre, although somewhat exceptional, deserve particular notice on account of the circumstance that they are obtained without the aid of any fertilizer: they are a practical illustration of the fitness of these reclaimed marshes for a remunerative cultivation. This gratifying result receives still more significance from the fact that the production of satisfactory crops is by no means confined to a comparatively small area, but has been observed upon the most extensive portion of the reclaimed marshes. Wherever, either by natural advantages or by a judicious management, the saline character of the soil-waters has been weakened, the crops have been satisfactory, provided the season, and the selection of the crop with reference to the mechanical condition of the soil, have favored the enterprise. The preparations for the coming season have been more general than in previous years. Much confidence is placed in preparing the surface, by mere harrowing, for grass and grains. Red-top and rye have been largely sown, and are apparently taking the lead: oats will follow next in importance. The prospects for the season, on the whole, are considered very good. Less than ten acres are reported having changed ownership during the past year. An attempt has been made during the past year, by the owners of the reclaimed marsh-lands and the constructors of the dike, to induce the State Legislature to protect their enterprise against claims of damages for alleged injuries to the harbor. The Legislature has referred the question to the Supreme Court as a court of equity: no action has been taken. The present unsettled legal aspect of the matter cannot do otherwise than exert an unfavorable influence on the adoption of a more thorough system of improvements,

and thus retard the progress in the cultivation of the reclaimed lands. The growing public sentiment in favor of the reclamation of marsh-lands on a larger and more general basis has received of late a very valuable practical support by the very judicious and highly commendable decision of the Massachusetts Agricultural Society to offer a considerable sum of money as premiums for successful attempts to bring marsh-lands under cultivation. The moral influence of this act is felt at Marshfield, and its enterprising farmers will not be found missing among the successful competitors.

C. A. Goessmann.
George M. Baker.

SECOND DAY.

The Board met at ten o'clock, A.M., Hon. Henry B. Peirce in the chair.

Present: Messrs. Abbott, Bagg, Baker, Brown, Chadbourne, Clark, Comins, Damon, Davenport, Fenn, Goessmann, Hadwen, Hersey, Johnson, Knowlton, Knox, Lewis, Macy, Merrill. Moore, Peirce, Phinney, Sargent, Slade, A. A. Smith, M. J. Smith, Upham, Vincent, Wakefield, Ware, Warner, and Wilder.

Voted, To appoint a committee to consider and report upon the time and place of holding the country meeting. Messrs. M. J. Smith, Arthur A. Smith, and Hersey.

Voted, That a committee be appointed to consider and report a list of subjects for investigation and essays, and the committees to which they shall be assigned. Messrs. Clark, Sargent, and Ware.

Voted, That a committee be appointed to nominate two members of the Examining Committee of the Massachusetts Agricultural College.

Mr. Baker requested to be excused from acting on the committee upon the times of holding the county shows; and Mr. Damon was appointed in his place.

Mr. Moore, for the Committee on Credentials, submitted the following

REPORT.

The committee appointed to examine and report upon the credentials of newly elected members respectfully report that they have attended to that duty, and find the following duly elected:—

Benjamin P. Ware	by the *Essex Society.*
John A. Goodwin	" *Middlesex North.*
Thomas J. Damon	" *Middlesex South.*
O. B. Hadwen	" *Worcester.*
William A. Warner	" *Worcester West.*
John F. Brown	" *Worcester North.*
Abiel K. Abbott	" *Highland.*
Otis J. Davenport	" *Deerfield Valley.*
Avery P. Slade	" *Bristol.*
John Lane	" *Plymouth.*
James S. Grinnell . . .	appointed by the *Executive.*

John B. Moore,
F. C. Knox, *Committee.*
John E. Merrill,

The secretary made a statement of the circumstances under which he entered upon the duties of his office on the 14th of February, 1853. The Board had been organized by an Act of the Legislature, signed by the Governor, on the 21st of April, 1852, and had requested Dr. Edward Hitchcock, the president of Amherst College, to take the office; but the earnest entreaty of the trustees prevailed, and he finally declined. The Board then wrote to Mr. Flint, who had recently gone to establish himself in New York, asking his opinion as to what the duties and the qualifications of such an officer should be. This opinion was given at some length, without the slightest idea that the Board had any thought of fixing upon him as a candidate. Soon after, a letter was received from a member of the Board, asking him if he would consent to take the office if the Board should unite upon him. This question was promptly answered in the negative. To take it would involve an entire change in the cherished plans of his life; and his education had not been directed in a way to qualify him especially for such a position.

Soon after this, a letter was received from a committee of the Board, asking him to come to Boston and confer with them; which he did, but not with any intention of changing his plans. After several interviews, and consultation with many friends best capable of giving advice, the decision was finally made to accept the office. The nomination was made to the Board; and the present secretary was elected, with the understanding that he should be allowed to pass several months at the Sheffield Scientific School at New Haven.

It was expressly understood that the office would not be subject to the caprices of an annual election. With any other condition, the position would have been declined without a second thought. It involved too complete a change of the whole plan of life to make it prudent for any young man to embark on an uncertain voyage. The committee representing the Board stated this point very emphatically. They said, "We want you to take the office, grow up into it, and make yourself useful for twenty years to come." Now, twenty-five years — a quarter of a century — having passed, the secretary desired to tender his resignation to the Board,— a step which he had long contemplated, as many members already knew.

The secretary, thanking the Board for the entire cordiality, confidence, and unanimity with which the members had always co-operated with him, tendered his resignation of the office.

The resignation was referred to a committee, consisting of Messrs. Chadbourne of Williamstown, Clark of Amherst, Moore of Concord, Wakefield of Palmer, and Phinney of Barnstable.

This committee, after full consideration, submitted the following preamble and resolution, and moved their adoption: —

Whereas, Hon. Charles L. Flint has presented to the Board a statement concerning his connection with the same during the past twenty-five years, and has offered his resignation as secretary:

Resolved, That the Board desires to express its high appreciation of the valuable services of Secretary Flint, and hereby earnestly requests him to withdraw his resignation, and continue the good work on behalf of the agricultural interests of the Commonwealth, in which he has achieved so enviable a reputation.

Col. Clark, President Chadbourne, Dr. Wakefield, Mr. Ware of Marblehead, delegate of the Essex Agricultural Society, and others, spoke eloquently in favor of the adoption of the resolution.

While the preamble and resolution were under consideration, Col. Wilder came into the Board, when the Secretary of State resigned the chair to him, upon which he gave many interesting and valuable reminiscences of the past operations of the Board, and expressed regret that Mr. Flint should have taken advantage of his absence to submit his resignation, which he had strictly enjoined him not to do. Col. Wilder desired to join in the expressions of gratitude to Mr. Flint for his most acceptable services as Secretary of the Board for this long course of years. He said he had feared that Mr. Flint would tender his resignation, and had prepared some resolutions to meet such an emergency; and, as he had lost the opportunity to express his feelings, he would submit them now, and he was requested to do so. They were as follows:—

Resolved, That the thanks and gratitude of the Massachusetts Board of Agriculture are eminently due to the Hon. Charles L. Flint, for the ability and fidelity with which he has discharged the duties of secretary for the last twenty-five years, in a manner alike honorable to the Commonwealth, and beneficial to its people.

Resolved, That we tender to Mr. Flint our personal acknowledgments for the courtesy and kindness which have ever characterized his intercourse with the members of the Board, with the sincere desire that the remainder of his days may be as happy and prosperous as the past have been honorable and useful.

The resolutions were added to that already submitted, and all were unanimously adopted.

The following is the statement submitted by Col. Wilder:—

HISTORY AND PROGRESS OF THE BOARD.

BY MARSHALL P. WILDER.

GENTLEMEN,—With the close of this session, the first quarter of a century in the history of the Massachusetts Board of Agriculture will have terminated. In view of this

fact, and also that only one member of the original Board, and Secretary Flint, are present with us on this occasion, and that he who now addresses you will soon be numbered among those who will have passed beyond the river, to work with you no more, I have thought it proper to submit a few thoughts in regard to the history and progress of the Board, although at the risk of repeating some things I may have stated before. The results of our labors are so fully set forth in the beginning of the secretary's report, and in former reports, as scarcely to need an additional remark, except by way of confirmation. And what I shall say, I beg may not be considered as valedictory for myself or for the Board: God only knows when the time shall arrive for the utterance of these. As for the Board, we believe it will speak for itself for many years to come.

Anterior to its establishment, very little united action had taken place between the agricultural societies of our own or other States of the Union for the purpose of creating State Boards of Agriculture. But the example of Massachusetts and a few other States produced a change in public sentiment, which has resulted in great improvement. True, there were agricultural societies in many of our States, some of which still live in a green old age, and are actively at work with us; but there were no State Boards of Agriculture, with representatives, constituting, as they now do, departments for great agricultural influence and importance. It is also true that there were many illustrious examples of men, who, as pioneers, were endeavoring to establish the importance of science as especially applicable to agriculture; but it was not until the appointment of Henry Colman of Massachusetts as a State Commissioner in 1836, that such improvement took definite shape; and, notwithstanding his reports were suspended in 1840, they are now regarded as treasures of great practical knowledge, especially those in regard to the character of our soils, the reclamation of waste lands, and the adaptation of crops. These awakened a more thorough examination into the subject; and the seed then sown finally germinated, and produced the Central Board of Agriculture. This was organized March 20, 1851, Marshall P. Wilder as president, Henry W. Cushman and John W. Lincoln as vice-presidents, Allen W. Dodge corresponding, and Edgar K. Whitaker

recording secretaries, with three delegates from each of the incorporated societies. At a meeting of the Central Board of Agriculture, Jan. 14, 1852, it was resolved to petition the Legislature in the following resolution: —

"*Resolved*, That, inasmuch as agriculture is the chief occupation of her citizens, the Commonwealth, in the organization of her government, should be provided with a department of agriculture, with offices commensurate with the importance of the duties to be discharged, and the labors to be performed."

This action resulted in the establishment of the present State Department, which succeeded the Central Board of Agriculture.

This Act was passed in the session of 1852; and Mr. Flint entered upon his duties as Secretary of the Board in February, 1853, which office he has filled with signal ability and fidelity for a quarter of a century, and with honor to the Commonwealth, having fully justified the unqualified indorsement of Hon. Edward Everett, president of Harvard College at the time of his graduation, who earnestly recommended him for election.

One of the best things which Massachusetts has ever done to advance the cause of agriculture was the creation of this Department of Agriculture, and locating the office of the secretary at the Capitol. This has been a source of great convenience to the public, as reliable information can there be obtained from the best sources, and where the secretary is always at his post. This centre of information has become of great inportance, where persons have been put in communication with one another, so as to be able to obtain particular classes of stock, positions on farms, as foremen, &c. It is a convenience to both parties. This, in future, will be more recognized and appreciated.

By the Act constituting the State Board, all the duties which had been performed by the secretary of state in regard to agricultural matters now devolved on the secretary of the Board of Agriculture. This new and independent system of operations was established, whereby the secretary became the chief officer and organ of the Board, on whom has devolved ever since the duty of digesting the returns of the societies, and of preparing the annual volume

of the department. Thus the Board became the organ of the farming community, being placed near and connected with the government; so that the whole legislation in reference to bounties, premiums, and general agricultural interests of the State, has been controlled or influenced by the department; and thus by its operations it was also brought into friendly communication and reciprocal relations with the various local agricultural associations of the Commonwealth and country, dispensing to them, and receiving in return, valuable information for the benefit of the public.

Few are aware of the salutary influences which the Massachusetts Board of Agriculture has exercised on the farming community and the public mind during the period of its existence. An entire and complete change has taken place in public opinion with regard to the paramount importance of agricultural education. There are some here who remember, at the time of the organization of the Board, the great prejudice which existed against what was then termed "book farming;" and there were but few papers or periodicals that would boldly stand forth as champions of the cause.

But, amidst all the discouragements, here was sustained and cherished the first general efforts for the establishment of an agricultural college, now so favorably known and appreciated; and here, ever since, it has been fostered and encouraged as one of the most important branches of education, receiving the patronage of the government, and good will of the people. Almost an entire revolution has taken place in the received principles and practices of cultivation during the existence of the Board; and much of this can be traced to the investigations of its members and the publication of their experience, thus not only teaching each other, but making the knowledge of one the property of all.

And here it may be stated, that, twenty-five years ago, the agricultural literature of the country was far from being creditable to us. Most of the works of ability were reprints of English publications, and were not generally read, or adapted to our location. The Board has contributed largely to the improvement of the agricultural literature of the country, raising it to a much higher standard of merit, until now it stands on a par with that of any other science.

Among the labors of the Board it should also be remem-

bered that it early instituted an elaborate series of farm experiments.

It originated the law for the protection of sheep, which has also been adopted by many other States.

It effected legislation for the organization and encouragement of farmers' clubs, which are now so popular and useful.

Twenty years ago it was difficult to get an audience of farmers to listen to the most distinguished scientific men, like Agassiz and Johnson: now farmers will go great distances to hear lectures from such men upon agriculture.

It originated the law for the inspection of fertilizers, and appointed the State agricultural chemist.

And, as a crowning glory, it arrested the progress of that dreadful scourge, the pleuro-pneumonia, and extirpated it from our State. Had it not been for the united and persistent action of the Board, it probably would here, as in Europe, have devastated not only our own, but other States, at a loss of hundreds of thousands, if not millions, of dollars. But who that is cognizant of these facts can doubt that this action of the Board with reference to that disease was worth more to the State and the country than many times the cost of our department from the beginning, or the expenses of sustaining it longer than any of us shall live?

In regard to the influence of the Board we have a striking illustration of the power of association as stated by Mr. Webster. "The great truth of the present generation," said he, "is that public improvements are brought about by voluntary combinations and associations." So it has been in the operations of this Board.

It has brought together from time to time a band of the most intelligent, practical, and scientific co-workers that the State possessed, and it is to this centralization that we are much indebted for the progress we have made. If any one doubts this, let him examine the reports of the Secretary for the last quarter of a century, and I think he will have his doubts removed.

With the Report now in press there will have been published twenty-five yearly volumes, containing more than sixteen thousand pages of matter pertaining to agriculture and kindred pursuits, including numerous engravings of cattle, horses, swine, farm-implements, and other illustrations, some of which are of high character as works of art.

These annual volumes, embracing in all an issue of more than two hundred and fifty thousand copies, have gone forth not only to the farmers of this Commonwealth, but have been distributed throughout our own and foreign lands. They constitute a comprehensive library in themselves, embracing essays, reports, and discussions on almost every subject in agriculture, and are eagerly sought for with every issue.

These reports have greatly promoted the objects for which the Board was established, and extended its influence far and wide. No similar publication, within my knowledge, contains more practical and useful information for farmers. Complete sets have already become valuable, and are more and more appreciated. By these reports young men have been stimulated to become farmers; and by the example of the Board, and the correspondence of its members, other States have been led to establish State Boards of Agriculture on our plan.

Nor must it be forgotten, that, from the first, the Massachusetts State Board have been the firm friends of agricultural education, and have always co-operated heartily for the advancement and welfare of the agricultural college, whose influence is now beginning to be felt, not only at home, but in the far-off islands of Japan, where, to the honor of our Commonwealth, William S. Clark, the president of her agricultural college, has erected the first agricultural college of Japan, and installed in its faculty (under the auspices of that nation) a president and two professors, all of whom were graduates of the Massachusetts Agricultural College.

Gentlemen, I have spoken with freedom; for I have co-operated with this Board from its inception, and am familiar with its operations. I have ever felt a deep interest in the agriculture of Massachusetts, especially in the welfare and usefulness of this department; and I think facts fully substantiate the statements I have made. I have therefore thought it but just to submit to you my views in regard to what it has accomplished in the first quarter of a century of its existence. This I have done, without any intention of magnifying its importance, and only for the purpose of rendering justice to those who assisted in laying its foundations, and also to those who have labored with us for its advancement. Most of its progenitors have been removed from their

earthly mission. Only one of the original members (he who now addresses you) and Mr. Secretary Flint are now connected with the Board. Nearly all the rest of the twenty original members constituting the Board have passed away. If any think I have spoken too favorably of the Board, or what it has accomplished in the first twenty-five years of its existence, let them compare the condition of agriculture at the time of its organization with the subsequent improvement, in well-defined and systematic knowledge, of the present day.

When we consider the embarrassments which most institutions have to labor under in their early history, I think we may regard the operations of the Board as reasonably successful. Our movements are in the right direction; and in the future as in the past, time will greatly promote the prosperity and wealth of the State.

For myself, I desire to be thankful that I have been permitted to witness the progress already made by the Board. Soon all of those who were banded together at its organization will have ceased from their labors on earth; but I rejoice that I have lived to see the doubts and opposition of that day pass away, and the Board receive, as it does, the public favor and the fostering care of the government. But we cannot stop here. Much has been accomplished; but greater results are to be attained. We have but just entered the field which Massachusetts is to occupy in the successful cultivation of her lands; and we confidently believe the time may not be distant, when science shall have improved the arts of cultivation to its utmost extent, and we shall better understand the laws which govern it; when, by a better knowledge of the constituents and capacities of our lands, a proper division of labor, a wise selection of crops and the constituents for fertilizing them, we may be enabled to compete favorably with the richer lands of the West.

This review of our work should be satisfactory. Much of our progress is the result of individual exertion; but, after all, the grand motive-power is associated effort. Let us, then, take fresh courage, and work right onward for the advancement of our cause, thus receiving and disseminating information for the benefit of all. And as you come up, from year to year, from all parts of our Commonwealth, with the results of your observation and experience, may you have

the satisfaction of believing that you have done and are doing something to increase the wealth, happiness, and prosperity of the people of our beloved Commonwealth.

On motion of Major PHINNEY it was unanimously

Voted, That the thanks of the Board be presented to Col. WILDER for the highly interesting facts in regard to the history and the operations of the Board for the last quarter of a century.

Major PHINNEY then reported upon the Marshfield Society; Mr. MILO J. SMITH, upon the Worcester West; Mr. CHADBOURNE, upon the Hingham; Mr. HADWEN, upon the Bristol; Mr. KNOWLTON, upon the Martha's Vineyard; and Mr. BAGG, upon the Worcester.

Professor Sargent submitted the following: —

NOTES ON TREES AND TREE-PLANTING.

BY C. S. SARGENT,
Director of the Botanic Garden and Arboretum of Harvard University.

The following remarks may be considered as supplementary to a paper[1] contributed by me to the Report of the Board of Agriculture for the year 1875. They are the result of investigations made since the publication of that paper, and undertaken in the hope of adding to the short list of trees from which planters on the barren soil and in the severe climate of New England must select their material for profitable sylviculture.

The value for New-England plantations of the white ash, white and Scotch pines, European elm, white oak, the hickories, white willow, sugar-maple, and European larch, has already been considered; with these may perhaps be advantageously associated the following native and foreign trees: —

The Red, or Norway Pine (*Pinus resinosa*, Ait).

A native of the Northern United States, from the Atlantic to beyond the Great Lakes, and from the mountains of Pennsylvania to the shores of Hudson's Bay, the red pine, though found growing in several localities in Massachusetts,

[1] A Few Suggestions on Tree-Planting.

is less common here than farther north, where, however, it never forms extensive forests, and only appears in isolated clumps of a few hundred trees, either growing singly, or mixed with the more common conifers of the North. The fact that it is found growing spontaneously in different parts of this State, and the excellent results which the occasional experiments in its cultivation here already promise, prove that the red pine is well adapted to our soil and climate.

It is doubtful if red-pine lumber now ever reaches the large eastern markets, so rare is this tree becoming in the New-England States; but large quantities are still exported from Canada to Great Britain, where it is highly valued. A recent English writer on timber, speaking of the Canada red pine as it appears in the English markets, says, "The wood is white, tinged with yellow or straw-color: it is tough, elastic, moderately strong, and possesses a clear, fine grain, which works up well, bearing upon the surface a smooth, silky lustre. It is not apt to shrink, split, or warp much in seasoning; and, technically speaking, it stands well, which renders it a choice and very valuable wood for all kinds of construction, while in the domestic arts there need not be any limit to its application."[1] As compared with white pine, red pine is heavier (the author quoted above gives its specific gravity as .553; that of white pine, as .435; and that of the common New-England pitch-pine, as .659), much stronger and stiffer, and, from the greater amount of resinous matter which it contains, more durable, although less easily worked, and less adapted to interior finish or fancy-work.

As an ornamental tree the red pine is destined to take a high place. Its rapid growth, clean, red-barked stem, and feathery foliage, make it the most ornamental of the two-leaved pines, of which the Austrian and the Scotch are the most commonly planted, although greatly inferior to their little-known American relative. The red pine will succeed in any soil which will produce the white or the pitch pine, although in the valley of the Saco, and around the base of the White Mountains, I have found it associated almost entirely with the former.

The value of the red pine for both economic and ornamental plantations is now well understood, and the impossibility

[1] Timber and Timber-Trees. — LASLETT, p. 271.

of procuring seed has alone delayed its general cultivation in the Northern States. The red pine, under the most favorable conditions, does not produce seed every year, and at no time is the crop abundant, or easy to collect. In those localities in Maine and New Hampshire where formerly this tree was not rare, few young plants are springing up; and there is serious danger that one of the most useful and beautiful of our native trees will, before many years, entirely disappear from the Eastern States. For this reason, this brief notice of the red pine is introduced here, in the hope of inducing systematic efforts in New England and the Northwestern States to procure a supply of its seeds, and thus place within reach of Northern arboriculturists a tree of undoubted value and great promise.

The Wild Black Cherry (*Prunus serotina*, Ehrhert).

My attention has been called to the capabilities of this tree for economic planting by finding it growing at various points on the New-England coast, in the most exposed situations, on the poorest soil, and often within the direct influence of the salt spray. A tree that grows spontaneously and with considerable vigor in such situations can be cultivated successfully in almost any portion of the United States, within its natural range, whatever the soil or the exposure.

Naturally the wild cherry extends over a wide territory: it is found from the Great Slave Lake in the north? (Richardson) to Florida, and from the Atlantic to the Mississippi. Through all the Northern and Middle States it is a common forest-tree; but, in the rich lands watered by the Ohio and its tributaries, the wild cherry attains its largest size, and develops its best qualities; and it is still not uncommon to find in the less thickly settled portions of the West specimens eighty to one hundred feet high, and from three to four feet in diameter. A slow-growing tree on the poor soils of the seaboard, the wild cherry increases with great rapidity in the rich deep lands which it prefers. An examination of many specimens cut from trees grown in Northern Illinois, and in other portions of the West, shows an average annual increase of wood of over half an inch during the first twenty years: beyond that age, the growth is naturally less rapid;

but on this point I am unable, from want of sufficient material, to speak with exactness.

The wood of the wild cherry is comparatively light, the specific gravity[1] of the dry wood being but .454, while that of black walnut equally dry is .539 (the average of two specimens), or eighteen per cent heavier. It is close grained, compact, and not liable to warp. Of a dull, light-red tint, which deepens with age, it in time almost rivals the best mahogany in color. For these qualities, and because it works easily and advantageously, the wood of the wild cherry is highly valued by the cabinet-maker. It is also now largely used for interior finish; and it is the only American wood employed in making what is known as "ebonized" work, that is, furniture dyed black in imitation of ebony. Cherry is still considered the best wood for window-sashes. The application of wild cherry to the finish of expensive interiors is of but recent date, and promises a large demand for this wood; while for cabinet-making the annual consumption is rapidly and steadily increasing, although still far behind the more popular black walnut, which, in spite of its sombre color, still supplies the material for fully three-quarters of all the hard-wood furniture made in the United States. The following table of the actual prices, in the Boston market, of the principal American woods employed in cabinet-making, will show the comparative estimation in which they are held, and will furnish an intimation of the probable supply of first-class material for this purpose.

Black Walnut	$75 per 1,000 feet.
White Oak	65 " " "
Cherry	60 " " "
Butternut	50 " " "
White Ash	40 " " "
Sugar-Maple	40 " " "

The wood of the wild cherry when dry burns well, without snapping; but it is soon consumed, and, from its lightness, is inferior to nearly all American hard-woods commonly employed as fuel. In heat-giving qualities, hickory,

[1] This determination, as well as all those which occur in the following pages, has been made for me by S. P. Sharpless, Esq., 114 State Street, Boston, the State assayer. In every case the specific gravity given is that of the perfectly dry wood.

the American standard, is eighty-four per cent its superior. The amount of ash left after wild cherry is burned is remarkably small, being only eighteen hundredths of one per cent of the weight of the dry wood consumed.

The facility with which young plants of this tree are raised from seed, the ease with which they may be transplanted, their hardiness, rapid growth, and power to resist rough usage, render the wild cherry a valuable subject for forest-planting on a large scale; while the great and increasing demand for the wood insures a certain and profitable sale for all that can be raised.

In many portions of New England the wild cherry can be successfully cultivated, and, wherever the soil is moderately deep and rich, it will be a safe and profitable tree to plant.

In the Middle and Western States it will, I think, be found one of the most satisfactory and useful timber-trees that can be employed in forest-planting, and, although not a native of the States beyond the Mississippi, its great hardiness and adaptability to various soils lead me to hope that the wild cherry will succeed in the treeless regions of Kansas and Nebraska as well as the less valuable trees which have generally been planted there.

The fact that the wild cherry is the favorite home of the American tent caterpillar, which preys on its foliage, and, unchecked, finally injures its growth, is the one serious drawback to this tree. Great as this objection is, it will disappear before energy and concerted action.

The American Cork, or Western Rock Elm (*Ulmus racemosa*, Thomas).

This tree is found growing with the common American elm, and in situations similar to those selected by that tree, from the south-western county of Vermont, westward to Illinois, and from the Ohio northward into Canada. It is common in New York, along the banks of the Mohawk and its tributaries, and in Yates County, near Penn Yan, and occurs in many parts of Ohio and Illinois: but it is in the southern peninsula of Michigan, Wisconsin, and the Province of Ontario, that the rock elm is most frequently met with. This species will be readily distinguished by the disposition of the flowers, which, unlike those of other elms, are borne

in racemes one to two inches long, and composed of several clusters of two to four flowers together: it may be distinguished also from the common American elm, at all seasons of the year, by the thick corky ridges which extend along the young branches. The wood, too, will be found to be very dissimilar from that of the American elm. Its specific gravity is .832, while that of American elm is but .649, or twenty-two per cent lighter. It is almost as heavy as the best eastern hickory, four per cent heavier than the best San Domingo mahogany,[1] and twenty-six per cent heavier than second-growth eastern white oak.

The wood is fine grained, compact, and shows but little of that inclination to splinter which renders the wood of the American elm unfit for many purposes of construction. The heart-wood, which is buff in color with reddish tints, is susceptible of high polish, and is warm and agreeable in tone. Architects and cabinet-makers to whom specimens have been submitted speak of it with unqualified praise for furniture-making and interior decoration, for which purposes its hardness, strength, and beauty seem to particularly adapt it.

The wood of this tree is unknown in the eastern markets. But considerable quantities of what is called Canada rock elm are annually exported into Great Britain from Canada; but, judging from the descriptions of it, I am inclined to think that this is nothing but American elm, or perhaps a mixture of the two, as lumbermen do not well distinguish this species, calling all elm grown on high and rather dry land "rock elm," and all that is produced along the river-banks and in damp situations, "bastard elm."

Although still unknown in the east, the wood of *Ulmus racemosa* is highly valued in those portions of the Western States where it is abundant enough to form an article of commerce. It is very largely employed in the manufacture of heavy agricultural implements, such as ploughs, mowing and threshing machines, and similar articles, in the construction of which the best white oak is used in the east. In spite of its weight and strength, this wood is very flexible, and, when properly seasoned, retains any shape into which it has

[1] Messrs. Holt and Bugbee, dealers in mahogany and other hard-woods, 173 Friend Street, Boston, have kindly supplied me with specimens of mahogany and other woods, for the purpose of carrying out these investigations.

been bent, a quality which finds for it important employment. In some parts of Michigan, rock elm is largely used for the frame-work of chairs, and for the hubs of wheels and the heavy beams of stump-pullers it has no equal. It is used for the slats of stock-cars, and for this and other purposes large quantities are annually consumed by the railroads. Indeed, the wood of this tree is generally employed wherever it can be procured, and where a material combining at once strength, toughness, and solidity, is required. Should it reach the eastern markets, the qualities which have caused it to be eagerly employed wherever it is known will find for rock elm a ready sale here; while, unless the opinion of those experts to whom specimens have been submitted is a mistaken one, it will be one of the most valuable, as it is one of the most beautiful, of American woods for the architect and cabinet-maker.

Taking the standard of weight as the best test of the heat-giving quality of any wood, and of the length of time it will continue to burn, rock elm is barely surpassed as fuel by hickory itself. The specific gravity of eastern second-growth hickory is .838; that of rock-elm, .832; and that of second-growth eastern white oak, .662; so that, applying the test of weight, rock elm as fuel is worth only one per cent less than hickory, while it is worth twenty-six per cent more than white oak, the best fuel which now ever reaches this market in any quantity. Actual experiments show that this wood burns slowly, with a bright steady flame, and without snapping: ash equal to sixty-seven hundredths of one per cent of the dry wood consumed is left after burning. As is to be expected of a tree yielding such heavy, close-grained wood, the rock elm grows very slowly. Specimens[1] before me, cut from trees grown in Michigan, show that the annual layers of wood vary in width from one-sixteenth to one-eighth of an inch, and that the tendency of this tree is to grow more rapidly with increasing age. One stem, only five inches in diameter, shows sixty-seven annual layers; but this specimen doubtless grew in very unfavorable soil, as a tree

[1] I am particularly indebted to Professor W. J. Beal of the Michigan State Agricultural College at Lansing, for excellent specimens of the wood of *Ulmus racemosa*, and for much interesting information in regard to its employment in the Western States.

of the American elm growing with it gained but six inches in sixty-five years.

Never a common tree, the rock elm is fast disappearing from even those parts of the country where formerly it was the most abundant; and steps should at once be taken to propagate and plant what must be considered, in spite of its slow growth, one of the most valuable of American timber-trees. I cannot learn that the rock elm has ever been cultivated, except in the new Arboretum of Harvard University, where seedlings three or four years old are perfectly hardy, and are growing about half as fast as American elms of an equal age.[1]

The methods employed to propagate and cultivate the American elm will be found equally successful with the rock elm, which will, I am confident, find itself at home in any part of the United States, and in any situation where the American elm will thrive. The cultivation of the rock elm cannot, however, be recommended in those portions of the country infested with the canker-worm, which will doubtless attack indiscriminately the foliage of all the North American elms.

The Ailanthus (*Ailanthus glandulosa*, Desf.).

It is probable that no tree has been at once the subject of so much undeserved praise and of such ignorant and foolish abuse as has been bestowed on the ailanthus by its friends and enemies in the United States during the last fifty years. At one time more popular as a shade-tree in this country than any other native or foreign tree has ever been, its very name soon became a term of reproach; and in recent years its rare advocates in American journals, reflecting the opinion that has of late been formed in regard to this tree in Europe, have been read with entire indifference, if not with positive contempt. A careful examination of the serious objections to the ailanthus, and of whatever merits it may be found to possess, will perhaps lead to a more just appreciation of its real character and proper uses.

[1] Since writing the above, I have learned from Dr. S. H. Wright of Penn Yan, N.Y., that *Ulmus racemosa* has been occasionally planted in that town, and that its rate of growth is not slower than that of American elms of the same age, and growing under similar conditions.

First introduced in 1751 into Europe from the northern provinces of China, the first ailanthus was planted in the United States in 1784, by Mr. William Hamilton, at Woodlands, near Philadelphia.[1] In 1804 it was first planted in New England, at Portsmouth, R.I., near which place this tree is still more abundant than in any other portion of New England with which I am acquainted. The cultivation of the ailanthus in Europe was for many years confined to botanic gardens, and other large collections; and it was only at a comparatively recent date, and after its leaves were found to furnish food to a silk-worm (*Bombax cynthia*), that attention was drawn to it as a possible subject for sylviculture. Its value for this purpose seems to be already fully established; and immense numbers are planted, especially in France, where it has succeeded even beyond the most sanguine expectations; the best results being obtained on calcareous soils, and along the sandy seacoast, while the only failure recorded is on the southern slopes of the Maritime Alps, where even the ailanthus has succumbed to the burning sun and excessive droughts of the summer months.[2]

This gradual rise in popular estimation, based on scientific investigation and exact knowledge, is precisely opposite to the history of the cultivation of the ailanthus in the United States.

Early in this century, or certainly before 1820, people began to plant this tree about their houses, attracted by its remarkably rapid growth, the tropical appearance of its graceful foliage, and its entire freedom from the attacks of insects: these advantages, together with the fact that it grew as rapidly in the streets of New York and Philadelphia as in the country, soon created a wide-spread feeling in its favor. So great did this popularity become in a few years, that the extent to which the ailanthus was planted was only limited by the ability of nurserymen to supply the demand for it. It was thought that at last a tree was found that was destined to take the place of all others for city planting; but, unfortunately, this opinion was based on very imperfect information of its habits and character. It was

[1] Trees of America. — BROWNE, p. 157.

[2] For an interesting account of the experiments in planting the ailanthus in France, see Revue des Eaux et Forêts, vol. xi. p. 180.

soon discovered that the trees showed a strong tendency to throw up numerous suckers; and, as soon as they grew old enough to flower, that some of the flowers emitted a strong, and, to most persons, offensive odor; and that the clouds of pollen shed from the flowers, and the flowers themselves, dropping on neighboring roofs, so affected the water caught on them as to render it unfit for use, while the flowers falling to the ground made the country yard or the city sidewalk unbearably disagreeable.

This peculiarity of its flowers once discovered, the ailanthus rapidly sank in popular estimation. A general destruction of it was advocated, and soon put into execution, and the few which escaped serve but to remind us of its former popularity and rapid decline.[1] Some recent writers have claimed that this tree is diœcious; that is, that its male and female flowers are produced on different plants, and that, as the male flowers alone emit the disagreeable odor, the pistillate flowers being free from this peculiarity, its principal objection could be overcome by propagating and planting only the individuals bearing female flowers.

This could easily be done; and the experiment is worth trying, although the ailanthus is not diœcious, but polygamous, and produces some perfect flowers, varying probably in number in different individuals, among the pistillate ones. Such perfect flowers have, of course, anthers; but whether they emit the same disagreeable odor as the staminate flowers, or whether they are ever abundant enough to be perceptibly disagreeable, further observations alone can determine. But, numerous as the merits of the ailanthus are as an ornamental tree, they are more than outweighed by its positive defects; and its cultivation cannot be recommended, either as a city-street tree or in the neighborhood of dwellings, more especially as later explorations in its native country have given us other trees, not dissimilar in appearance, of equally rapid growth and hardiness, in which no serious defects have yet been detected.

A doubtful subject, then, at best, for ornamental planting,

[1] I am particularly indebted to Mr. Francis Skinner, who, with praiseworthy industry, has examined the files of agricultural and other special journals for information in regard to the cultivation of this tree in the United States, and who has rendered me other assistance in preparing this paper.

let us consider what merit this tree may possess from an economic point of view, and what its natural and proper uses really are.

Comparative experiments,[1] made a few years ago by an employé of the French Government in the dockyard at Toulon, on the wood of the ailanthus, show the following results. The ailanthus timber was from trees from twenty-five to thirty years old, and presumably was in a similar condition of dryness[2] as the other woods tested in connection with it.

SPECIFIC GRAVITY.		Tenacity, or Number of Pounds required to break with a Tensile Strain.	Flexibility.
Ailanthus, average of 7 specimens	.713	72.186	.003
Elm, average of 7 specimens	.604	54.707	.023
Oak, average of 10 specimens	.751	43.434	.027

These experiments show that the wood of French-grown ailanthus is in weight between European oak and European elm, and that it is actually considerably stronger and more flexible than either. I have had the specific gravity of three specimens of the wood of the ailanthus, grown in New England, determined, because the weight of any wood will indicate more readily than any other possible test its value for purposes of construction or fuel, as, in general terms, the heavier a wood is, the harder and stronger it is, and the greater the amount of heat-giving qualities which it possesses. These determinations give the following result: —

Specific gravity of ailanthus-wood from a young tree grown in Portsmouth, R.I.	.607
Specific gravity of ailanthus-wood from trunk of a tree twenty-seven years old, grown in Brookline, Mass.	.593
Specific gravity of ailanthus-wood from main branch of the Brookline tree	.642
Average	.614

1 See Comptes rendus de l'Académie des Sciences, Paris, vol. lxi. p. 344.

2 Undoubtedly these determinations were made on wood simply air-dried and in a proper state for use. This supposition accounts for the discrepancy between the weight of the wood of the French and New-England ailanthus.

But, to show more clearly the real value of the wood of the ailanthus, it will be necessary to compare its specific gravity with that of some of the woods commonly employed in the United States, either for cabinet-making or as fuel.

Specific gravity of		ailanthus	.614
"	"	eastern hickory	.838
"	"	best San Domingo mahogany	.800
"	"	eastern white oak	.662
"	"	black walnut	.577
"	"	canoe birch	.539
"	"	Honduras mahogany	.521
"	"	wild cherry	.488

So that, considered as a wood for cabinet-making, ailanthus is twenty-three per cent lighter than the best mahogany, and sixteen per cent heavier than the ordinary mahogany with which this market is principally supplied: it is but seven per cent lighter than the best eastern second-growth white oak, while it is six per cent heavier than black walnut, and twenty-six per cent heavier than wild cherry.

In structure the wood of the ailanthus bears a close resemblance to that of oak. The annual layers of wood are clearly and strongly defined by the accumulation on their inner side, in one to three rows, of large dotted ducts; the exterior portion being made up of very small, compact cells, through which, however, unlike the structure of oak, are scattered other smaller ducts, intermediate in size between the large exterior ones and the small cells, which form the compact portion of each annual layer. The medullary rays are unusually numerous, and clearly defined, although thinner than in white and many other species of oak. The wood of the ailanthus is of a pale straw-color, unlike in appearance that produced by any of our native trees. It is susceptible of high polish, and, when cut vertically, the large medullary rays (the silver grain of the cabinet-maker) give it a bright satiny appearance, which is heightened by contrast with the brown lines marking the commencement of each annual growth. It is about as hard as black walnut, and can be worked as easily as that wood. It is readily and easily seasoned, and shows no inclinations to warp or start.

In Providence, R.I., there is a set of furniture made from the wood of two ailanthus-trees, only twenty years old, and

which had grown in the yard of a city house there. This furniture has been in daily use for nearly twenty years; and its solidity and beauty furnish a strong argument in favor of the value of ailanthus-wood for cabinet-making. In this connection I am glad to be able to quote the opinion of the mechanic who was employed to make this furniture, and who is now a large furniture-dealer in Providence, because the testimony of a practical mechanic in regard to the way a wood works will naturally have greater weight with other practical men than a theoretical opinion in regard to it, based on its specific gravity and structure. The following letter, giving his opinion of the value of ailanthus-wood, has been sent me: —

> I would say that I have a very high opinion of its merits, from its beautiful color (resembling satin-wood), its compactness, the facility with which it can be worked, and its reliability as to keeping in place: indeed, it has all the merits which manufacturers of cabinet-work value. It can be seasoned as easily as walnut or mahogany, as my experience has shown me. As to its shrinking and warping, I regard it as superior to walnut, and fully equal to mahogany. When cut from full-grown trees, it would cut up as economically as first-class walnut or ash. In its grain the wood is very fine, and weighs about the same as mahogany. It has no unpleasant odor. It does not dull tools any more than mahogany, and can be seasoned quite as readily. When its merits are known, its market-value would be fully equal, I should think, to that of the best walnut, say twelve to fifteen cents per foot.
>
> JAMES H. FIELD.
>
> PROVIDENCE, January, 1878.

Other experts to whom specimens of this wood have been submitted speak of it in equally enthusiastic terms, either for cabinet-making or for interior finish, for which its light, cheerful color, and freedom from any tendency to shrink, particularly adapt it. For the treads of stairs, the floors of mills, offices, and other buildings where constant use requires a hard, strong wood, it is probably superior to any of the woods commonly employed in such situations. From its structure, it is not improbable that ailanthus will be found nearly as durable as white oak, when exposed to the weather; but on this point I am unable to speak with certainty, as experiments covering a sufficiently long period of time to be of any value have not come under my notice. Should, however, this opinion of its durability be confirmed, the ailan-

thus will be one of the most valuable trees that can be raised for railroad-sleepers.

As fuel, the best hickory is worth twenty-seven per cent more than ailanthus, but the days when hickory can be used as fuel are nearly over; white oak is only seven per cent its superior in heat-giving qualities; and canoe birch is fourteen per cent inferior to it. I make this comparison because nearly all the fire-wood now consumed in Boston and the other New-England seaports is imported from Nova Scotia, and of this fully seventy per cent is canoe birch. This imported fuel is selling in Boston at retail at from eight to ten dollars per cord, and it is safe to predict that ailanthus will always be worth fully that sum for fuel in the eastern cities. Actual experiments show that this wood burns without snapping, steadily and slowly, even when unseasoned, giving out a clear bright flame, and leaving a good bed of coals. The amount of ash left is equal to sixty-seven hundredths of one per cent of the weight of the dry wood consumed.

It is not probable, that, in this climate, the ailanthus is a long-lived tree: the fact that it is endowed with varied and remarkable powers of reproduction seems to point to this conclusion, which is strengthened by its habit of growth, for, unlike the oaks and other long-lived trees, the ailanthus increases in size most rapidly during its earliest years. The largest and probably the oldest specimen in the United States, of which I have heard, is at Bartram's Botanic Garden, near Philadelphia. According to Browne [1] this tree was planted in 1809: in 1853 it was seven feet in circumference; [2] and at the present time it girts nine feet four inches, as Mr. Meehan, who has kindly measured it, informs me. A specimen growing in Bristol, R.I., and said to be about sixty years old, girts seven feet at three feet from the ground; and another, growing in Tiverton, R.I., on the gravelly shores of Narragansett Bay, and fully exposed to the wind, in about as unfavorable a situation for tree-growing as could well be found, girts, at four feet from the ground, six feet seven inches: this specimen is only about forty years planted Three trees planted in an equally exposed situation on the shores of Narragansett Bay only twelve years ago, and grow-

[1] Trees of America.

[2] The American Hand-Book of Ornamental Trees. — THOMAS MEEHAN.

ing on the slope of an old gravel-pit, average three feet six inches in girth four feet from the ground; while a tree lately cut in Brookline, Mass., with twenty-seven annual layers of growth, is only fifteen inches in diameter four feet from the ground. This tree grew in good garden-soil, and had eleven and a half inches of heart-wood and three-fourths of an inch of pith in its centre. Two trees planted at Chickis, Lancaster County, Penn., in 1837, were, in 1868, eighteen inches in diameter: in 1877 these trees were cut down, having died, apparently from old age, and measured, at two feet from the ground, one five feet four inches, the other five feet eight inches. The soil in which they grew was poor and gravelly, resting on a deposit of quartzite of Potsdam sand. In that locality the ailanthus has become entirely naturalized,[1] and now grows there spontaneously as freely as any of the native trees. These few observations point to the fact that the ailanthus grows with nearly equal rapidity in poor and in rich soil, and that it is particularly adapted for planting in exposed situations along our seaboard. Experiments made with this tree in Europe lead to a similar conclusion. Mr. George P. Marsh, in describing the efforts of the Russian Government to cover with forest-growth the steppes extending along the coast of the Black Sea, near Odessa, where the soil is of a particularly loose and sandy character, says, —

"The tree best suited to this locality, and, as there is good reason to suppose, to sandy plains in general, is the *Ailanthus grandulosa*, or Japan varnish-tree. The remarkable success which has crowned the experiments at Odessa will, no doubt, stimulate similar trials elsewhere; and it seems not impossible that the arundo and maritime pine, which have fixed so many thousand acres of drifting sands in Western Europe, will be partially, at least, superseded by the tamarisk and the varnish tree."[2]

He quotes also on the same subject from Rentsch, Der Wald, pp. 44, 45, the following: —

"'Sixteen years ago,' says an Odessa landholder, 'I attempted to fix the sand of the moving steppes, which covers the rocky ground to the depth of a foot, and forms moving hillocks with every change of wind. I tried acacias and pines in vain; nothing would grow on such a soil.

[1] As I am informed by Dr. S. S. Holdman of Chickis, Penn., by whom the two trees were planted in 1837, and who has kindly furnished me with the account of their growth.

[2] The Earth as modified by Human Action, p. 391.

At length I planted the ailanthus, or varnish tree, which succeeded in completely binding the sand.' This result encouraged the proprietor to extend his plantations over both dunes and sand steppes, and, in the course of sixteen years, this rapidly-growing tree had formed real forests. Other landholders have imitated his example with great advantage."[1]

There are thousands of acres of shifting sands and barren soil along our seaboard, from Cape Cod southward, too poor and too exposed to produce naturally any thing but a scanty crop of beach-grass, on which the ailanthus would thrive, and which, thus covered, would add enormously to the natural products of the country. Such plantations would amply and speedily repay their original cost, both in direct income, and by the protection they would afford to more valuable land. Valuable timber for purposes of construction might not grow on soil so poor and exposed, but immense quantities of fuel easily accessible to the great markets would be produced from land now worse than useless to its owners.

On almost every inland farm there is some old, neglected gravel-bank, or stony knoll, too poor for cultivation, which, if sufficiently distant from dwellings, might be profitably planted with the ailanthus; and these plantations would provide in a dozen years, more or less, a large amount of valuable fuel, and might be cut over and over again indefinitely, as there seems no limit to the powers of this tree to throw up suckers from the root. Or, if permitted to grow from twenty to forty years, such plantations, costing but little to make, and occupying land good for no purpose but to pay taxes on, would produce a valuable material for the cabinet-maker and the builder, for which a ready sale and good prices could always be obtained.

A line extending from Boston, Mass., in the East, to St. Louis, Mo., in the West, must be considered as about marking the northern limit of the territory in which the cultivation of the ailanthus can be safely undertaken, as, farther north, it is liable to suffer in severe winters. It is to be expected that the hardiness and rapid growth of this tree will particularly adapt it for planting in some portions of the treeless regions of the West. An experiment was made in 1872 with the ailanthus at Ellis, and other points on the line of the Kansas Pacific Railroad, in the extreme western part of the

[1] The Earth as modified by Human Action, p. 608.

State of Kansas, a region which presents greater difficulties, perhaps, to the tree-planter than any other within the United States. At first offering every hope of success, these plantations have not fulfilled their early promise; and Mr. R. S. Elliot, by whom they were made, writes me that he does not consider that the ailanthus can be successfully employed in Western Kansas. Further experiments, however, should be made with it there, as well as in the eastern and southern portions of that State, where the natural conditions seem to indicate that its cultivation will be followed with better success.

No tree can be more easily propagated than the ailanthus; indeed, some of the most serious objections which have been urged against it are its proneness to throw up suckers, and the readiness with which its abundant crop of seed, widely scattered by the aid of an ingenious appendage contrived for that purpose, springs up in all sorts of situations; serious objections in an ornamental tree in cultivated ground, but positive merits where it is employed to cover barren and exposed seacoast or treeless prairie. Every piece of the root, which need not be half an inch long, if planted like a potato will produce a plant; and the seed, whether scattered on the ground, or covered with a thin layer of soil, will quickly germinate. But few enemies attack the ailanthus. In some localities about New-York city and Brooklyn, the ailanthus silk-worm has become naturalized, and preys on its foliage. In the same localities, and in St. Louis, Mo., the ailanthus-worm[1] (the lava of *Œta compta*) feeds on its leaves, making the tree look black and seared, as though scorched by fire. But these are neither very serious nor wide-spread enemies to a tree which seems otherwise entirely free from insect attacks.

A few North-American trees supply the cabinet-maker with more valuable material, the wood of some others certainly makes better fuel; but a careful study of the ailanthus from an economic point of view, and as a subject for sylviculture, forces on me the conclusion that no other tree, either native or foreign, capable of supporting the climate of so large an area of the United States, will produce, in so short a space of time, and from land practically useless, so large an

[1] Report of Missouri Agriculture: Entomology, 1868, p. 151.

amount of valuable material, valuable alike for construction and for fuel.

Sylviculture on the waste lands of New England, as a money-making enterprise, has been discussed in various quarters of late; and many persons, while applauding the planting of trees for sanitary or ornamental purposes, have denied that the planter could ever expect, either for himself or his children, a satisfactory money-return for his outlay. It has been impossible to meet such statements directly; for American sylviculture is in its infancy, and has not yet actually shown us, through frequent and carefully-conducted experiments extending over many years, whether timber-growing in this country is as profitable an employment of money as it has proved to be in every country of Europe.

A single experiment worthy of record in this connection has been brought to my notice: the number of years through which it has extended, and the remarkable accuracy and care with which all accounts of the disbursements and receipts of money in connection with it have been kept, make it as powerful an argument in favor of the direct profit to be derived from tree-planting as a single example can furnish.

This experiment, which I shall briefly describe, is of peculiar interest. It was, without doubt, the first attempt at any thing like sylviculture ever made in New England, and probably the first in the United States. Its value is increased, too, by the fact that he whose broad intelligence and public spirit prompted him in his early manhood to make a strange and unpromising experiment is still alive, and with powers as unimpaired as when, nearly sixty years ago, he planted a worn-out hillside with trees, with no hope or expectation beyond benefiting another generation.

Previous to 1820, Mr. Zachariah Allen of Providence, R. I., on the division of the estate of a relative, became possessed of a tract of land, forty acres in extent, situated in the town of Smithfield, eight miles from the city of Providence. This land, which had been constantly used as a pasture for nearly a hundred years previous to its coming into Mr. Allen's hands, was at that time entirely worn out. The

situation was an elevated one, and completely exposed to the wind, the forty acres occupying the summit of a high hill, of granite formation. The surface was marked with ledges, cropping out in projecting cliffs, with intervals of loamy soil, covered with a scanty herbage, and supplying nourishment to a few struggling white birches and the other hardy plants which still too clearly mark our barren pastures.

It was found impossible to lease the land for pasturage, so exhausted had it become; and the owner, pressed by the absorbing duties of an active and useful life, had neither the time nor the inclination to devote himself to restoring the lost fertility to his new possession by the rapid and expensive methods known to the agriculturist. So he determined to try the experiment of planting the whole of the forty acres, or that portion of them where the rock did not come to the surface, with the seeds of forest-trees, both because the trees, once established, would require but little future care and attention, and because he saw that such an employment of his land would bring some time or other, and if not to him to some one else, a certain though slow return.

The planting was done in 1820; and seeds of the chestnut, different oaks, the hickories, and the locust, were planted. On those portions of the land where a plough could be used, shallow furrows were run, ten feet apart, and the seed planted in the furrows. On the rougher parts of the hill-top the seed were put in by hand, wherever soil enough to cover them could be found. The whole cost of planting was but forty-five dollars. The following statement is taken from Mr. Allen's ledger, on which all charges against his Smithfield estate, and all the receipts from it, have been faithfully and minutely entered during a period of fifty-seven years. The price of the land, fifteen dollars per acre, is what it was appraised at on the division of the estate, and is higher than the value as shown by the taxes, which for years, were under two dollars and a half per annum for the whole forty acres.

A lower valuation of the land would have greatly increased the actual profits of the plantation, although the account, as it stands, must be a strong argument for the money profit to be derived from New-England sylviculture. The valuation of

the wood now standing is that of an expert in such matters, and the whole crop could be sold at the price he has fixed.

Nothing is credited for the increased fertility of the soil, enriched during more than half a century by an annual deposit of leaves, or for the present permanent wood-bearing condition of the land, which will enable it to produce trees indefinitely, without further care or expense. These are substantial and important benefits, resulting from Mr. Allen's experiment, but they are omitted, because it is impossible to represent their actual value in dollars and cents.

Actual Profit of a Plantation of Forty Acres, made in Smithfield, R.I., by Zachariah Allen, Esq., in the year 1820.

Dr.	
Forty acres of land, valued at fifteen dollars per acre . .	$600 00
Expenses of planting	45 00
Interest on investment as above, fifty-seven years, at six per cent	2,205 90
Taxes (town, road, and school), building and repair of walls, during fifty-seven years	352 01
Interest on above item at the average time of half of fifty-seven years, or twenty-eight years and a half, at six per cent,	601 92
	$3,804 83
Cr.	
Land at original valuation	$600 00
1820 to 1824, sale of small wood	60 00
1827 and 1828, sale of small wood	50 14
1831, sale of poles	6 26
1855 to 1861, sale of fire-wood to Dexter Lime Rock Company,	899 37
1862 and 1863, sale of fence-posts	42 68
1864, sale to U. S. Government of locust timber . . .	55 00
1864, sale of locust posts	35 00
1871 and 1872, sale of four hundred and ninety-five cords of fire-wood to Dexter Lime Rock Company, at $3.25 per cord, standing	1,608 75
Interest on sales of wood, at six per cent	2,190 86
Dec. 31, 1877, value of wood growing on the forty acres, and estimated by an expert to be three hundred and twenty cords, worth $2.50 per cord, standing	800 00
	$6,348 06
	3,804 83
Profit	$2,543 23

Equal to $6\frac{92}{100}$ per cent per annum on the original investment for the whole period of fifty-seven years.

Dr. WAKEFIELD, for the committee, submitted the following essay upon the

SAVING AND PREPARATION OF MANURE ON THE FARM.

Manures lie at the foundation of all successful husbandry. Plant-food is stored up in the soil by processes of nature, and continues to increase while undisturbed; but, when removed by cropping, the equilibrium must be restored by the application of something containing these elementary principles; and for the farmer the main supply is furnished by the manure-heap. Every plant needs and takes up most of the original elements of its being from the soil in its immediate vicinity. It is modified by heat and light, gathering some of its elements from the atmosphere, absorbing therefrom, through its leaves, the vital organs thereof. Plants spring from seeds, grow, mature, fall, decay, are restored to their elementary ingredients, buried in, mixed with, mother-earth, and again stored, and held for future use.

Most of our soils contain all the ingredients necessary and essential to the propagation of all crops, with the exception of these three; viz., nitrogen, phosphoric acid, and potash. Carbon enters largely into the composition of all plants; but of this nature furnishes an ample supply, and the farmer need give himself no anxiety about its failure. If these three essential ingredients are furnished the soil in profusion from the barnyard, from nature's or the chemist's laboratory, a series of croppings can be carried on with this twofold result, — increase of crops, and improvement of soil.

In this way of husbandry, which is the only successful, and for a series of years the only paying way, is success achieved, which proves to the husbandman, as his crops increase, his barns are filled, his garners burdened, and his broad acres teeming with plenty, that the "Lord loveth the cheerful giver."

The question before us is, How shall the manure-heaps be increased and improved, and the compost-piles from all sources on the farm be saved, enlarged, and utilized?

1st, The barns should be so constructed, that all the manure, solid and liquid, can be saved, and no particle suffered to go to waste. This truism cannot too often nor too forci-

bly be inculcated. The liquid droppings are as valuable as the solid for manurial purposes, if properly treated. The barns should be constructed with cellars to protect the solids from exposure to the sun, winds, and rains, and supplied with absorbents sufficient to take up the liquids, so they can be handled and utilized as well as the solids; remembering that the plant-food in the liquids is already in a state of solution, prepared in the laboratory of the animal, ready to be taken up by the rootlets of the plant, and without waiting for elaboration after it has been committed to and mixed with the soil, which furnishes the balance of the ingredients heretofore stored in its bosom.

Another fact should never be absent from the mind of the farmer, — that, the better the animal is fed, the better will be the residuum after the meat (lean and fat), the milk, butter, and cheese have been eliminated by the animal to which it has been fed. Another point should be ever in mind, that manure secured from the rays of the sun, the winds, and rains, should not be exposed to such a hasty process of decomposition as to throw off the ammonia, depriving it of its nitrogen, and leaving a refuse, in value compared with manure properly decomposed as would the ashes from a ton of hay or grain compare with the hay or grain before it was consumed.

2d, The barns should be so located, that the drainage therefrom should not flow into the road, nor into a stream, but should be turned on the surrounding lands; so that the fertilizing elements can be absorbed, and taken up by the rootlets of grasses and plants, instead of being wasted by the wayside, or carried by the stream till diluted and wasted; or may be deposited for the benefit of some one down stream who has no claims for this deposit.

3d, The barnyard should be so located that it should not receive water from any other source, but so as to retain its own.

Heat and moisture are two essential requisites for the decomposition of manure; but it is not necessary that it should be in a Sahara or a deluge. Ordinarily, here is deposited the larger part of manure; and here, also, should be located the compost-heap, which may be made a deposit of fertilizers hardly second in importance to the manure-heap itself. This is the place where the animals spend a great part of their time for the greater part of the year.

If properly cared for, it may be made a source of great profit: if neglected, it will become an eyesore to every beholder, and become a source of discomfort, annoyance, and contagion to all its surroundings. The same principles will apply to the hog-pen, which may become a source of profit, a promoter of good husbandry, or a source, from its villanous compounds not neutralized, of contagion, disease, and death to the swine, the cattle, and even the family and the neighborhood.

Having disposed of the farmer's barns, let us turn our attention to the farm-house and its surroundings. One prime reason why the boys are so prone to desert the farm, and the girls are so unwilling to follow the occupation of their mothers, is, that the home, with its buildings and surroundings, is not made more pleasant and attractive. The difference between the odors of the pig-pen and a bed of roses, of the cesspool and a plat of geraniums, is perceptible, in a marked degree, to the olfactories of every one whose sense of smell has not always been abused and blunted, till it has become insensible to any odor that has not attained to the rankest smell. These waste not their fragrance on the desert air, but offend the senses of the inmates doomed to inhale them, till the perfume of the pen and pool is preferred to that of the sweetest fragrance that may or should be around every farmer's home.

The pen, the pool, and the privy are the necessary concomitants of every well-regulated family; but it is the manner in which they are regulated that makes them tolerable or unendurable. How shall these unseemly parts of the farm-house be made comely, and turned to profit, converting by natural processes the noxious effluvia into elements from which spring vegetables, fruits, and flowers in their varied plant-forms? Let these be surrounded with shrubbery, evergreens, or vines, substituting the beauty of nature for deformity of art. Nothing generated in Nature's laboratory is more thoroughly disinfectant, a better absorbent, more free or accessible, than dry earth. Let sufficient quantities of this be secured, — gathered from the washings of the roadside, from the mounds around the walls, and from every available source, — freely used each day, and a double purpose will be achieved, — a nuisance abated, a fertilizer created.

To one of these reservoirs let all the liquids from the house be committed daily, covered with the disinfectant, and occasionally transferred to the great reservoir, the barnyard, where the effluvia may all be converted to a substance innoxious as the carbonate of ammonia, and here securely held, to be subsequently — when chemically combined with every thing else that can be gathered from the farm — transferred to the soil, and then transmuted by the wonderful process of growth into grasses, fruits, and flowers. And while we are considering how to dispose and make the most of the manure from horses, cattle, and swine, let us not forget the sheep and the hens. Probable there is less waste in sheep husbandry, and a greater from the hennery, if neglected, than that occasioned by poor management in the keeping of any other of the animal creation.

Every farmer who has neglected his flock of hens, caring little for their products and less for their feed, would be perfectly astounded at the results of these manufacturers of fertilizers, when properly cared for, and their droppings saved, manipulated, and utilized after the most approved manner. By so doing, a deposit of guano may be brought to each farmer's yard, with but very little or no direct outlay, and a fertilizer of the best kind, sufficient for an acre of corn, roots, or grass, may be provided; and he will never realize that it has cost him a single additional penny.

We would lay down this axiom, — no one can afford to purchase commercial fertilizers, and neglect to husband any resource around his own premises, when by so doing he can secure one equally valuable, without money or price, and at the same time remove from around his buildings and fields fallen leaves, the refuse of crops not consumed by his cattle, corn-butts, potato-vines, which, if suffered to remain, mar the beauty of his enclosures, are in the way, a source of annoyance, and if suffered to be thrown around the premises, and to decompose in the yards, are deleterious to the health of the family. Hundreds of lives have been sacrificed by the secret poisons of typhoid-fever and diphtheria generated in farmer's cellars from decaying wood and vegetables, from the unsuspected cesspools and sink-drains festering with mephitic gases, and filtering into the wells that supply the family with water, or generating a miasm that walketh in

darkness, and a pestilence that wasteth at noonday. Let all decomposing substances be removed from the house-cellar to the barn-cellar, the subtle poison arrested, and held in durance vile, till its properties deleterious to animal-life can be converted into an essential element of plant-life.

And, while the scavenger is around collecting garbage, let him remember the bones and the ashes. This refuse of every family contains ingredients which will produce a phosphate that no chemist can excel: the one contains phosphoric acid, and the other potash. Let the large bones be broken with a sledge, deposited in an old hogshead, with alternate layers of ashes and bones, and occasionally a little water poured on the mass: after a few months, if dissolved in dilute sulphuric acid for a few days, you will generate a fertilizer that will go a long way towards supplying, not merely the farmer, but any family, with garden vegetables, rendered sweeter from the fact that he not only raised them with his own hands, but also manufactured the fertilizer in his own laboratory.

Too often the farmer neglects his garden because he thinks he has not the time to devote to this secondary business, and cannot spare the manure from his more important crops. Let him improve his leisure moments some rainy day in this chemical process, and some leisure evening let him enter into a little mathematical calculation of the value of the products of a good, well-cultivated garden, draw a comparison between the value of these luxuries and the small cost of the manure which produced them; and he will spare time from his other pressing calls sufficient to make his garden "bud and blossom as the rose," making a thing of beauty a joy forever, and to make his better-half and joint partner, who is toiling with him for the common interest, more smiling, more captivating, than in days of yore, when he led her to the hymeneal altar, and will reconcile him to his extra efforts when he sees at how small a price his table can be loaded with the luxuries of the garden, and at the same time the family made more joyous, and the home more happy.

Having secured and collected the weeds, the leaves, the potato-tops, the corn-butts, the sawdust, the loam, the sand, and the muck, then comes the question, How shall they be disposed of? The leaves, sawdust, and dry earth will per-

form the double office of bedding and absorbent. The more comfortable and the warmer the animal is kept, the less will be the demand on hay and grain during the cold weather of this latitude. The animal is a machine that generates and maintains its own heat by the carbo-hydrates stored up within itself, or taken into its stomach from day to day. The Laplander will pour down the blubber of the walrus as a Dutchman would guzzle lager, while the dweller under a vertical sun has no call for such a diet.

The nearer the stable can approximate the tropics, and the farther removed from perpetual snow, the less will be the demand on the hay-mow and the hay-rick to sustain the heat and life of the animal. The free use of bedding supplied from any source adds to the comfort, and increases the warmth, of the animal, enlarges the manure-heap, and makes more plethoric both the animal and the purse of its owner. The potato-tops, the corn-butts, and every kind of refuse not containing noxious seeds, which will be carried over the land, may be spread over the barnyard, and ground up by the tread of the cattle while confined in the enclosure.

The weeds on the farm that have been permitted to mature their seed sufficient for germination should be placed by themselves, and thrown over, mixed with lime or some decomposing substance that will raise them to a germinating heat, or else burn the vitality out of them. And here let me say that this compost-pile will be small, and grow beautifully less, under the management of every thrifty, skilful farmer. No farmer can afford to grow weeds. It is one of the most exhausting crops, and takes from the soil the overplus of manure not required for the growing crop, which would otherwise remain stored up for succeeding crops. Weeds make a sufficiently vigorous growth without manure; and no one can afford to make, prepare, and haul his manure to propagate a nuisance, or to waste his energies by laboring to choke his wheat by a vigorous growth of tares.

When the farmer has exhausted all his skill in saving his manure, by composting the droppings from his stock with all the refuse from his crops, collecting saw-dust, sand, loam, any thing at hand to hasten decomposition; when he has gathered all from his privies, his sink-drains, his hennery, his sty, and his barns, and yet his pile is too small, — he may then

raise the question whether he can afford to buy commercial fertilizers.

In the preparation of manures the question may arise in the mind of the farmer, How much labor can I afford to spend in pulverizing and decomposing manure, beyond what is absolutely necessary to secure the best results from evaporation, avoiding burning, &c.? This is an important question, and one difficult to answer, because it depends on a variety of circumstances, — location of land, kind of soil, amount of labor, to what crops applied, how applied, &c. If the cellar be too small to hold through the winter all the manure manufactured, or if, with no cellar, it must be exposed to the droppings of the eaves, let it be drawn on the land while snow is on the ground, when the team is vigorous, when labor is not pressing, unless the fields to be cultivated next year are so steep, that the winter and spring rains will carry off the manure and a part of the soil. If the field be nearly level, the elements soaked out will sink into the soil, and, if not placed in large heaps, the spring ploughing and harrowing will so distribute it, that it will not be objectionable; but, if placed in large heaps to be used in the hill, more manure may be washed out and absorbed by the soil than is profitable for the next crop. This may be remedied by running a scraper through the bottom of the heap, carrying off the over-saturated soil, and returning an equal quantity of fresh soil from the immediate vicinity. If labor be scarce, if the grass-crop of succeeding years forms a part of the desired increase of crops, and also improvement of the soil, then manure from the barn may be drawn from the yard, and left to be decomposed, by the rays of the sun and the dews of heaven, in the laboratory of Nature, where the process will be more effectually done, if sufficient time be allowed, than can be done by artificial means. The sun, the rain, the wind, and time itself, can and will do the work thoroughly and cheaply; but if time, one of the factors, is absent, and all the manure is needed to raise the present crop, it must be reduced to such a state that it can be taken immediately as plant-food; or else some commercial fertilizer must be used to start the crop, leaving to the decomposed manure to carry out the crop, thereby securing a full one, and also having an amount of manure, equal to the amount of fertilizer used, stored up for succeeding grass-crops.

When the farmer has saved and utilized all his manures, and wishes still further to extend his operations, he may buy commercial fertilizers at a living profit. He may also do it when he wishes to improve land (and has no manure) so that he can keep stock and make manure, when he wishes to improve his land to which it is difficult to haul barnyard-manure, or when, from any circumstance, he wishes, for the time being, to cultivate more land than he can well manure. If a farmer understands his soils, knows what each piece needs (what shallow, what deep ploughing), how to apply his barnyard-manure (whether on the surface, just beneath, or still deeper), what crops are best adapted to his several fields, he can safely experiment with a commercial fertilizer that contains all the elements of plant-food. One reason why there are so many more failures from the use of fertilizers than from barnyard-manures, is, that the latter contain all the elements of plant-food, whereas many special fertilizers contain only a part. It is essential that every plant, to attain its full development, should have its full amount of each ingredient that enters into its composition; and failing to find this in the soil or manure, it cannot substitute any other, although it be present in abundance. Partial manures answer for certain crops that feed largely on the article used, and also for certain fields where Nature has stored up the other ingredients in profusion.

A vast amount of knowledge is needed to adapt the manure and the soils to the crops in order to obtain the most certain results; and yet failures come from other reasons than misapplication of manures.

We have the promise of "seed-time and harvest, summer and winter, cold and heat," the early and the latter rains; and yet we have a failure of the crops, because the early or latter rains come not at that particular juncture essential to their perfection. The soil may be prepared in the best possible manner, supplied with the most productive manures and in the greatest profusion; and yet, if the dews of heaven cease to fall, and the rain is withheld, the crop will be a failure. Moisture is an element in plant-growth as essential as manure, and is ordinarily provided by a kind Providence, for which the husbandman makes little provision, and takes less heed. But let this be wanting in May and early June, and

"the grass withereth and the flower fadeth;" or let the latter rains be withheld through July and August, and the brethren will have to go down to the land of the Nile to buy corn. Failures of crops are not all attributable to manures.

Deposits made in banks of earth and banks of manure are as safe as those made in banks of savings. Investments made in farming-stock receive as good dividends as those made in government bonds, or in bank or railroad stocks.

And here let me say, for the encouragement of every farmer, that he has a business safer, with less risks and better remuneration, as a class, than any other calling; and if he have not all the advantages in buildings, location, facilities, and circumstances, possessed by some of his more fortunate neighbors, let him take courage, and put forth every effort to make the most of his opportunities to improve his farm, his home, and his condition, remembering that he labors in an honorable calling, the earliest business of man, — one that lies at the foundation of every other business; one that has less peplexities, less failures and more successes, and which gives a truer, nobler independence, than falls to the lot of any other business, calling, occupation, or profession on the face of the whole earth.

For the committee,

HORACE P. WAKEFIELD, *Chairman.*

The essay led to a long discussion, in which Messrs. Chadbourne. Ware, Hadwen, M. J. Smith, and others participated, when it was laid over, under the rule.

Mr. HERSEY then submitted the following essay on

THE BEST METHODS OF OFFERING PREMIUMS BY AGRICULTURAL SOCIETIES.

The best method of offering premiums by agricultural societies is undoubtedly that which secures the best results; and the best results are those which give to the farmer information that enables him to secure the largest amount of money for the least expenditure of labor and material, and at the same time to keep his farm in a flourishing condition.

Since the commencement of the present century, the farmer has derived great benefit from improvements secured by premiums offered by agricultural societies. His barn is filled with better breeds of cattle; his orchards produce better varieties of fruit; and his garden, vegetables in greater variety, wonderfully improved. But, notwithstanding the great improvements that have been made, there is a vast unexplored field before us. We seem to be standing on the edge of that period when science is to take the leading part in lifting up and advancing the condition of the farmer.

The time has gone by when a Massachusetts farmer can succeed by physical force alone; and the time has come when to till the soil successfully requires the exercise of the brain quite as much as any other occupation. We have such a great variety of soils, such sudden changes of weather, with no two seasons alike, that it is very difficult to establish facts in relation to the production of crops. No single experiment is of any great value; but it requires a great number of experiments, covering a wide range of territory, and repeated several years in succession, all under the supervision of men who understand the importance of being accurate in all of their operations. Experiments thus tried would be of great value to every tiller of the soil. The large number of agricultural societies in this State, under the supervision of this Board, affords an opportunity to settle by carefully tried experiments many disputed points on important subjects.

The first great want of the farmer is to know the best method of saving the fertilizing materials which collect in his barn and around his dwelling; then he needs to know how best to apply them: but even then, if he does not have the best seed, and does not know how to cultivate in the best manner, he cannot expend his labor to the best advantage.

If agricultural societies could be induced to make a united effort, by offering liberal premiums, to obtain information on the saving of manures, and the value of commercial fertilizers as compared with stable-manure, it would in a few years bring out facts that this Board could collect and publish, that would be of great value to the people of the

State. The time has come when agricultural societies should pay less attention to, and offer less premiums for, large crops, without regard to cost, large squashes, without reference to quality, and horses whose only point considered is speed, and pay more attention to, and offer larger premiums for, the best methods of fertilizing and cultivating the soil, the improvement of seeds, and the scientific principles in the breeding of animals: for it is of no advantage to know how to obtain large crops of grain, if it increases the cost per bushel; or to produce mammoth vegetables, if they are unfit for feed; and the large sums of money that have been paid out for speed in horses have resulted in filling New England with a class of horses that are of but little practicable use; and at the same time has had a direct tendency to lower the moral standing of our agricultural exhibitions. With the aid of the able corps of scientific men who are engaged in investigating the qualities of fertilizers, the character and wants of the soil for particular crops, the laws relating to the improvement of fruits and vegetables and the breeding of animals, we may by united efforts, encouraged by liberal premiums, secure that action necessary to make such advancement in practical knowledge relating to the operations of the farm, as will make farming both pleasant and profitable, and cover the worn-out soil of the State with a luxuriant growth of feed for both man and beast.

Agricultural societies, in making up their list of premiums, should adopt a method that will not only encourage improvements, but also compel competitors to give true and detailed statements of the manner of securing the improvement; and, as a rule, awards should be made with reference to the value of the statement thus submitted.

An earnest and determined effort in this direction by the intelligent farmers of the State would do much to settle disputed points, and scatter abroad that information so much needed to enable the inexperienced to cultivate the soil to advantage.

In making up the list of premiums, societies should endeavor to introduce every year as many new and attractive features as possible, being careful to make every change an improvement. Where money-premiums only have been offered, it would add attractions, and create a renewed in-

terest, by offering a portion of the premiums in books, diplomas, and silver-ware.

EDMUND HERSEY.
JOHN B. MOORE.
C. S. SARGENT.

The essay was read, discussed, and laid over, when Mr. MILO J. SMITH submitted the following paper: —

GREEN CROPS AS A MANURE.

Much has been said and written upon the question as to how we shall best restore our exhausted out-lands; and various green crops to be turned under have been strongly recommended as a cheap, sure, and speedy means of restoration to such lands. After thirty years of experience and observation I cannot indorse the theory of it; and, in my opinion, all green crops (except clover) turned under in their full, succulent state, are a decided damage to land and the crop.

I have turned under clover at its full growth (both first and second crops), and the stubble after the hay-crop was taken off, and always with good results. It would undoubtedly be better still to let the crop ripen on the ground. The fact that the roots of a good clover-sod, to all appearance, are as valuable as the crop for fertilizing the soil, has, of late years, led me to hay off the crop; and, where hay is worth twenty dollars per ton, I do not think it advisable to turn it under. We find in the wheat-growing sections of the West, especially in the counties of Monroe and Genesee, New York, that, after cropping their lands with wheat for a series of years, they found the crop gradually failing. The straw became weak and puny, so as to invite the ravage of the Hessian fly, when they resorted to the use of clover. They found it greatly invigorated and strengthed the straw, so as to enable them to overcome many of the evils they had to contend with.

I will state my experience with buckwheat as a fertilizer. Some thirty years ago, I had a lot of land a little distance from my barn, that had been cropped for a long series of years, with but little manure returned; and, of course, crops

were light. I was desirous of improving the land, and increasing the crops. I had not the manure to do it with; and I had read glowing accounts of how cheap and quickly land could be brought up by ploughing in crops of buckwheat: so I prepared four acres of that lot, and sowed it to buckwheat, with the intention of ploughing it under at its full growth, and sowing rye after it. The buckwheat grew finely, and made a heavy crop. Just before the time for turning it under, there came a shower, with high winds, and laid it down flat. I attempted to plough it under, but found it difficult. I put on a drag, thinking to straighten it out, so that I could plough it; but it pulled up and dragged into heaps, so that it would not work. I called on extra help with hooks and forks, and, after getting over one acre of it, gave it up. I let the rest of the piece stand and ripen for seed, then mowed it off, but had to mow it close, it being lodged so badly. By that time, it was too late in the season to sow rye. The next spring I ploughed the whole piece, put on a light dressing of manure, and planted it to corn; and to my great disappointment, when the corn came to grow, the very poorest part of the piece was that where I turned under such a mass of green stuff. The corn looked yellow and sickly all the season; and by standing up on a bank so as to overlook the piece, one could see a vast difference in color and growth. It seemed to poison and sour the land to such an extent, that it took at least three years to get over it.

I cannot say but results might have been different with a rye-crop; but I have never sown a patch of buckwheat since.

It seems to me to be a very important question here in New England, how shall we best improve our pasture-lands. To a large extent, they are too high and hilly, and so far away as to put it out of the question to haul manure for them, even if we had it to spare. Many of them, in the days of our fathers, were the strongest and most productive part of the farm. They were formerly cropped with wheat, rye, and corn, until reduced too low to make it pay. Then they were given up to pasture; and the constant drain upon them since, in the form of beef, butter, cheese, mutton, and wool, has reduced them, so that they hardly pay for fencing and bushing, to say nothing of taxes, and interest on capital.

There are hundreds of acres in my vicinity, on which I have seen good crops of grain growing, that are now abandoned to brush and wood; and in many cases that is probably the best thing that can be done with such lands. But we need some pasturing, and feel that we cannot well do without it: so the question is often asked, What can we do to bring up our pasture-lands?

I have been trying some experiments within the last twenty years, which I think will pay; that is, to plough and sow such lands to rye and grass seed; apply some kind of fertilizer to insure a catch of seed (plaster and ashes will do it, and some of the fertilizers that are for sale); let it grow until about the time of heading out; then turn the cattle on, and let them feed what they will, and tramp the rest down. Don't be tempted to harvest it (that is going back to the old system), but let it do its work in protecting the young grass, so that it can get a good set. The feed will be trebled on such land for a number of years.

MILO J. SMITH.

THIRD DAY.

The Board met at ten o'clock, A.M., Major S. B. PHINNEY in the chair.

Present: Messrs. Abbott, Bagg, Baker, Brown, Comins, Damon, Davenport, Fenn, Goessmann, Hawden, Hersey, Knowlton, Knox, Lewis, Moore, Phinney, Slade, A. A. Smith, M. J. Smith, Upham, Wakefield, Ware, Warner, and Wilder.

A communication from the Commissioner of Agriculture was laid before the Board through his Excellency the Governor, relating to the representation of the agriculture of the State at the International Exposition at Paris. Referred to a committee, Messrs. Moore, Knowlton, and the Secretary.

Dr. WAKEFIELD, from the committee to which was referred applications for change of time for holding exhibitions, submitted the following —

REPORT.

The committee to whom was referred the subject of change of time of holding the Annual Fairs would report that they have heard the parties, and would recommend that the

Marshfield begin on the second Wednesday after the first Monday of September; the

Hampshire, on the third Thursday after the first Monday of September; the

Hingham, on the fourth Tuesday after the first Monday of September; the

Middlesex, on the fourth Wednesday after the first Monday of September; the

Deerfield Valley, on the third Thursday after the first Monday of September.

HORACE P. WAKEFIELD, *for the Committee.*

FEB. 7, 1878.

The report was accepted and adopted.

Messrs. Knowlton, Hadwen, and the Secretary were appointed as the committee on printing.

Col. WILDER submitted the following

REPORT ON FRUITS.

BY MARSHALL P. WILDER.

In accordance with the request of the Board, I have the pleasure to submit the following Report. Although it has been generally considered that the climate of Massachusetts is somewhat unfavorable to the cultivation of fruits, excepting the apple, it is found that the enterprise and indomitable perseverance of her sons compel her unfertile soil to yield some of the finest fruits that are produced in any part of the world; and it is safe to say, that nowhere else in the Union are finer specimens of the apple, the pear, the strawberry, and occasionally other fruits, to be seen, than at the exhibitions of the Massachusetts Horticultural Society. By the enterprise and perseverance of the cultivators of Massachu-

setts, many of the most popular varieties in our country have been raised from seed, constituting some of the most desirable sorts for wide and general cultivation.

With the close of this year, half a century will have passed since the organization of the Massachusetts Horticultural Society, from which has emanated, more than from any other source, the remarkable extension of fruit-culture which now permeates and enriches our whole land. In few things is progress more apparent than in the advancement of pomological knowledge on this continent. I have on many occasions spoken of this; but I have thought it might not be inappropriate, now, at the close of the first quarter of a century in the history and operations of this Board, to allude again to the remarkable

EXTENSION OF FRUIT-CULTURE, AND THE IMMENSE CROPS OF OUR COUNTRY.

At the time of the organization of that society, the cultivation of fruits for the market, or for exportation, was limited to a few states. In the year 1816 Mr. Coxe, the first great American pomologist, thought the fine apple-growing section bounded by the Mohawk River in the North, and the James River in the South. Fruit-growing in this State was confined principally to apples and peaches. But very few of the latter found their way to the markets of the North; while strawberries and other small fruits were scarcely to be seen, except in the locality where they were raised.

Now, the culture of fruits has extended from Canada to the Gulf of Mexico, and from the Atlantic to the Pacific coast. Almost every steamer from New York for Liverpool or London, in the fall and winter months, takes apples, varying from five hundred to three thousand barrels. Shipments have been made from other ports; and, as late as last May, there were fifteen hundred barrels sent to England from Philadelphia. In December last ninety thousand barrels of American apples were landed at Liverpool. These exports have varied much in yearly amounts, occasioned by scarce or abundant seasons. In 1861 the amount was only $269,000; in 1871 it was $509,000; while for the year ending June 30, 1877, it amounted to $2,937,025, — as kindly furnished me by Dr. Young, chief of the Bureau of Statistics, — showing

an increase of more than five hundred per cent in five years. Very little difficulty is experienced in the winter months; but arrangements have been made to ship in warm weather by vessels with refrigerator compartments.

As the refrigerating process becomes more and more perfect, it will aid largely the exportation, not only of apples, but of more delicate fruits. Pears, peaches, and grapes have been sent to England in good order; and it is confidently expected that American peaches will soon be well known in the markets of England.

How great the progress! Massachusetts, in fruit-culture as well as in other departments of educational and industrial life, has been a great leader; and from her has emanated, in the early history of American pomology, more than from any other source, the wide-spread interest that has distinguished our land.

Now, Canada, Iowa, Wisconsin, Minnesota, Kansas, Nebraska, California, Oregon, and other new States and Territories, where the cultivation of fruits had scarcely commenced when this Board was established, have made exhibitions of fruit at the various sessions of the American Pomological Society in Richmond, Boston, Chicago, and at the Centennial, which have astonished the world with the progress made. Thirty years ago, when this society was formed, the area of fruit-culture and the value of our fruits was so limited, that it was not thought worth while to collect the statistics. Then many states, Canada, and Nova Scotia, had given but little attention to fruit-culture, except that of apples. These and other sections were deemed too far north for successful fruit-cultivation. Now they produce large quantities of fine fruits, even in the cold northern regions; the Nova Scotia Society having received four medals from the Royal Horticultural Society in London, and the Ontario Society, at the quarter Centennial session in Boston in 1873, the Wilder Medal, for the best collection of fruits.

The estimate by the government for the Centennial, last year, furnished the following statistics of the fruit-culture of our country: —

The number of acres under cultivation in orchards, vines, and small fruits, is estimated at 4,500,000. The number of trees is estimated as follows: apples, 112,000,000; pears,

28,260,000; peaches, 112,270,000; grapes, 141,260,000; total, 393,790,000. The estimated value of fruit products is, apples, $50,400,000; pears, $14,130,000; peaches, $56,135,000; grapes, $2,118,900; strawberries, $5,000,000; other fruits, $10,432,800; making a grand total of $138,216,700, or nearly equal to one-half of the value of our average wheat-crop. California, to say nothing of figs, oranges, olives, and almonds, has sixty thousand acres of vineyards, and forty-three millions of vines yielding annually, besides grapes and raisins for the market, ten millions of gallons of wines, to which may be added the wines of Missouri, Ohio, and other states; the whole annual wine product being fifteen millions of gallons.

The following are a few illustrations of the immense quantities of fruits which are sent to market in addition to what is consumed at home.

Of strawberries, there were received in one day in the New-York market, at the height of the season, from all sources, seven thousand crates, — more than ten thousand bushels. The crop of peaches raised in this country is so enormous that we hardly dare state the quantity. The largest crop was in 1875; and, on the peninsula of Delaware and Maryland alone, it was estimated at between seven million and eight million baskets.

From California, there were sent east, in 1876, three hundred and thirty-four car-loads of fruit, of four hundred bushels each.

The increase of strawberry culture in the vicinity of Norfolk, Va., is astonishing, completely heading the page of horticultural progress. The shipments this year have been over three millions of quarts. There were nearly ten thousand pickers in the field in one day. One grower had a hundred and eighty-five acres. To Boston alone there have been shipped this year 11,547 crates, of forty-five quarts each, or more than sixteen thousand bushels.

The increase in the crops of apples in New York, Michigan, and the more Western States, is wonderful.

From New York, it is estimated, that, in abundant years, a million and a half of barrels are exported in addition to those consumed at home. One county, it is said, received one million of dollars a year for apples sold; a single firm at Boston receives from that State from thirty thousand to forty thousand barrels of apples per year.

The immense collection of fruit shown at the Centennial Exposition last year, surpassing even the great exhibitions of the American Pomological Society at Boston and Chicago, deserves mention here. One of the judges writes me, "I know that the judges examined over twelve thousand dishes of fruit during the week, commencing the 10th of September, and I have no doubt that the entire exhibition during the season reached the grand number of over sixty thousand dishes and over four hundred thousand specimens."

In view of the wonderful progress which has already been made, we begin to realize the great importance of American pomology; nor should we forget, as among the great benefits of fruit-culture, the employment of thousands of men, women, and children, or the immense amounts paid for freight on fruits to railroads, steamboats, &c., and the profits to dealers.

But who can estimate the amazing quantities of fruits that are to be produced on this continent, when the lands suited to fruit-culture are brought into use! Look at the vast amount of these in the eastern slope of our country, and, still more wonderful, the land on the Pacific slope! Of these, California alone has a territory eight hundred miles in length and two hundred miles in breadth, — three times as large as all of the New-England States, four times as large as the State of New York or Pennsylvania, — having millions of acres for fruit-cultivation.

Some have feared that there might be an over-production of fruit; but the whole crop may now be saved and utilized by the new methods which are being co istantly invented for curing and distributing this surplus. In fruit districts large amounts of capital are invested in establishments for the drying and canning of fruits, which promise to put the surplus of abundant seasons in condition for preservation till wanted for consumption or exportation. Some of these are yet to be tested; but no doubt exists that we shall eventually thus utilize our fruits, and make them not only profitable, but a source of increasing revenue.

The perfection now attained in the drying and canning process — possessing the great advantage, for transportation, of reducing the weight three-fourths or more by the removal of water, and rendering it capable of shipment to all climes,

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and of being preserved perfectly for years — will, in all probability, overcome this difficulty, which only occurs on bearing and abundant years. The demand abroad for dried fruits is very large, and is daily increasing. The exports for the year ending June 30, 1877, were 14,318,052 pounds; and, if they can be afforded at a little less price, it is thought it would be enormous. England, Germany, and Australia would be great purchasers. Besides, we are constantly inventing new methods for preserving fruits by preparations in various nutritious and elegant forms, which might absorb our abundant crops, and take the place of those unhealthy preserves and sweetmeats in which our markets abound, and which are so injurious to the health of our people.

By the production of new varieties from seed, we have not only secured native kinds adapted to every section of our country, but varieties which have prolonged the season of fruits in some sections, either by early or late kinds, for one or more months. Especially is this to be seen in the peach, grape, and strawberry; so that many of our market are supplied for a much longer period than ever before.

By the introduction of early peaches, the season for this fruit has been advanced nearly a month. From South Carolina and Georgia shipments were made last year to northern markets as early as May 25; and, by a wise selection of early and late peaches, Mr. Berckmans, president of the Georgia Horticultural Society, states that peaches may now be had from May to November. Similar illustrations might be given of the prolongation of the season of the strawberry, the grape, and the pear, in our markets; those of the north being now supplied with the strawberry from the first of May to the middle of July, and with the grape, the pear, and the apple, from the first of July until April or May. And why may not those who have the means supply their tables with fruits in some form through the year? Some of us already enjoy this luxury, beginning with the strawberry, and following, in succession, with the other small fruits, the grape, the pear, and the apple; thus furnishing a circle of fruits which delights the eye, gratifies the taste, improves the health, and crowns our daily meals throughout the year.

FRUITS FOR MASSACHUSETTS.

But to confine our observations to Massachusetts. I would state, that, with the exception of a few new seedling varieties, the same standard sorts as have been mentioned in previous reports still continue to be most prominent for the market.

In regard to those best adapted to the various sections of the State, I would remark, that by dividing the State into three sections, having Boston, Worcester, and Springfield as their centres, we may arrive at pretty correct conclusions as to the fruits most approved of for general cultivation.

EASTERN DIVISION.

Apples. — *Summer:* Large Early Bough, Red Astrachan, and Williams. *Autumn:* Gravenstein, Porter, Foundling, Holden Pippin or Fall Orange of Downing, Mother, Lyscom, Hubbardston Nonesuch, and Cogswell. *Winter:* Baldwin, Rhode-Island Greening, Roxbury Russet, Hunt Russet, King of Tompkins County, Northern Spy (strong soil and high culture). *Sweet Apples:* Pumpkin Sweet, Ladies' Sweet, Danvers Winter, Tolman Sweet, Pound or Lyman Sweet. Many other varieties succeed well, but are only grown in small quantities ; such as the Famense, Garden Royal, Maiden's Blush, Minister, and Washington Strawberry (a fine variety).

Pears. — *Early:* Doyenné d'Été, Beurre Giffard, Clapp's Favorite, Brandywine, Manning's Elizabeth. Clapp's Favorite surpasses others of its season in size and beauty, and is, withal, of fine quality, everywhere increasing in popularity. *Autumn:* Bartlett, Belle Lucrative, Beurre Bosc, Beurre Hardy, Beurre Superfine, Beurre Clairgeau, Doyenné Boussock, Doyenné du Comice, Duchesse d'Angoulême on Quince, Goodale, Howell, Louise Bonne of Jersey on Quince, Merriam, Paradis d'Automne, Seckel, Sheldon, St. Michel Archange, Souvenir du Congrès (a very handsome, large pear, ripening quite as early as the Bartlett), Urbaniste on Quince. *Late Autumn or Winter:* Beurre d'Anjou, Dana's Hovey (small, very rich, comparing favorably with the Seckel in quality), Josephine de Malines (as late regarded with favor), Lawrence, Winter Nelis (fine, but too small for market). *Cooking:* Vicar of Winkfield (on rich, warm soils, with care in thinning: a good dessert variety), Catillac, Uvedales, St. Germain or pound. *New Varieties:* The Mount Vernon (fine, late russet pear) is regarded with favor. The same may be said of Clapp's (No. 22, now Frederick Clapp), also of the President and Admiral Farragut, raised by the late Dr. S. A. Shurtleff. The Emile d'Heyst is a fine foreign, rare variety. Souvenir du Congrès is a very beautiful, large pear, quite as early as the Bartlett. The Beurre Diel and Flemish Beauty, like the White Doyenné, once so popular, are being discarded on account of cracking (occasionally they are as fine as ever). The orchards of Massachusetts, especially in the eastern

part of the State, abound in fine varieties of the pear. The above constitute the principal popular varieties in market; but, of all the sorts introduced within the last fifty years, no kind surpasses, in its combined characteristics of excellence, the Beurre d'Anjou. It increases in popularity every year, and with proper care is susceptible of being kept in fine condition for two or three months. Of the thousand or more varieties which I have proved in the forty-six years of experience, no other has given me so much satisfaction. It is also found, by the catalogues of the American Pomological Society, to succeed well in more than thirty of our States and Territories. And I think I may be allowed to say, without personal merit or motive, if I have done nothing else for the pomology of our country, that the introduction of this pear thirty-eight years ago was a blessing to our land.

GRAPES. — Few new varieties have been introduced of late. Those old sorts most approved of around Boston and in the eastern section of the State are the Hartford, Concord, Creveling, Delaware, Diana, Lindley (Rogers No. 9), Massasoit (Rogers No. 3), Wilder (Rogers No. 4). Barry (Rogers No. 43) is a fine kind, similar to the Wilder in size, appearance, and quality. There are a few new varieties which are regarded as giving good promise ; among which, especially, is to be mentioned Moore's Early, a seedling of the Concord. It is very prolific and constant in crop, ripening fully two weeks before the Concord, growing beside it. The bunch is large and handsome ; berry larger than the Concord, and equal in quality. It has been exhibited for several years before the Massachusetts Horticultural Society, and was awarded last fall a prize of sixty dollars for the best new seedling grape. It is considered a valuable acquisition for the north. The Worden, a new native variety, ripening earlier, and considered of better quality, than the Concord, by Mr. Hadwen of Worcester and Mr. Adams of Springfield, is being introduced around Boston. The Champion, as an early grape, is attracting some attention, ripening a week before the Hartford, of fair quality, very hardy, vigorous, and prolific. Hon. E. W. Bull, the originator of the Concord, Hon. George Haskell of Ipswich, and several other gentlemen, each presented seedling varieties at the exhibition of the Massachusetts Horticultural Society, some of which are of good promise.

STRAWBERRIES. — New varieties, some of excellent character, are coming to notice every year. The older kinds that carry off the prizes of the Massachusetts Horticultural Society are Charles Downing, Jucunda, Hovey's Seedling (now forty years old ; being the first successful attempt at improving the strawberry), President Wilder, Seth Boyden, Triomphe de Gand, and Wilson's Albany. The last is not regarded as of good quality, but is valuable for its productiveness. Among the new varieties which are attracting attention may be named the Belle, Caroline, and Hervey Davis.

CENTRAL DIVISION.

From the Annual Report of the Worcester-county Horticultural Society, a society second only to the Massachusetts for wealth, activity, and influence in New England, it will be seen that most of the fruits grown in

the eastern section of the State are alike successful in the central. Mr. Hadwen, our associate member, reports the following: —

Apples. — *Summer:* Red Astrachan, Williams, Duchess of Oldenburg, and Sweet Bough. *Autumn:* The Gravenstein, Porter, Twenty Ounce, Hubbardston Nonesuch, Cogswell, Maiden's Blush, Pumpkin Sweet, Leland Spice. *Winter:* Baldwin, Rhode-Island Greening, Yellow Bell-flower (on warm, rich soil), Ladies' Sweet, Leicester Sweet, Roxbury Russet. He also regards with favor the Sutton Beauty, Worcester Spy, Foundling, Washington Strawberry, Mother Apple, Holden Pippin, McLellan, Tetofsky, Sterling, Washington Royal or Palmer Greening, ("having as many desirable qualities as any apple"), nearly all of which originated in Worcester County, and are of excellent quality, yielding abundant crops. The soil and climate of Worcester County are especially adapted to fruit-culture, and has long been celebrated for the apples it has produced from seed, such as the Hubbardston Nonesuch, Holden Pippin or Fall Orange of Downing, Mother, Washington Royal or Palmer Greening, Sutton Beauty, Foundling, Worcester Spy, Leicester Sweet, and probably the Twenty Ounce or Cayuga Red Streak. Mr. Hadwen, in his excellent essay on the apple, states that the cultivation of the apple has long been an important interest in Worcester County; the money-value received in 1876 for apples exported, probably exceeding the value of any other product.

Pears. — Nearly all the sorts named in the list of approved kinds for Boston and the Eastern Division are alike adapted to the central section of the State. Reference, therefore, may be had to the list already given. Mr. James Draper, an intelligent nurseryman of Worcester, in his essay on the pear, regards with special favor Clapp's Favorite, Bartlett, Sheldon, Beurre d'Anjou, Beurre Bosc, Belle Lucrative, Lawrence, Duchesse d'Angoulême, Louise Bonne of Jersey, Doyenné du Comice, the three last named on quince.

Grapes. — Most of the grapes which succeed elsewhere at the north are on trial here. The most noticeable old and popular sorts are the Concord, Hartford, Delaware, Diana, Eumelan, some of Rogers's Hybrids, and the Worden, originating in Western New York.

Strawberries. — The "Essay on the Strawberry" of Mr. William H. Earle, an eminent cultivator, states that the most profitable kinds are the Charles Downing, Jucunda, and Wilson's Albany. Amateurs are growing all the new varieties. Of the profits of strawberry culture Mr. Earle remarks, "If one takes interest in the business, he will be surprised at the possible results. On about three acres of land I realized a gross income of a little over two thousand dollars."

WESTERN DIVISION.

Mr. John W. Adams, an intelligent cultivator of Springfield, regards the following as leading sorts: —

Apples. — *Summer:* Red Astrachan, Duchess of Oldenburg. *Autumn:* Porter, Gravenstein. *Winter:* Baldwin, Hubbardston Nonesuch, Tompkins County King, Northern Spy, Rhode-Island Greening. *Sweet Apples:* Sweet Bough, Orange Sweet, Talman Sweet.

Pears. — *Summer:* Doyenné d'Été, Manning's Elizabeth, Clapp's Favorite, Bartlett, Belle Lucrative, Doyenné Boussock, Duchesse d'Angoulême, Louise Bonne of Jersey, Onondaga, Seckel, Beurre Bosc, Lawrence, and Winter Nelis.

Grapes. — The grape-culture, Mr. Adams remarks, is still confined to a few varieties which have proved themselves best adapted to this locality. Among those classed for hardiness, vigor, and productiveness he names Concord, Clinton, Champion, Hartford, Ives, Martha, and Worden. He regards the Champion or Talman, which is the same, as the best very early grape, and the Worden as much prized, and earlier than the Concord. Of the Concord, Mr. Adams remarks, "A single vine, eight years old, on my own place, allowed to grow at random, ripened this year a quantity estimated to exceed three thousand bunches, equalling in sweetness and flavor those that came from the South."

Strawberries. — Mr. Adams states that the cultivation of the strawberry is increasing. The kinds most approved of are Charles Downing, Col. Cheney, Kentucky, Nicanor, Seth Boyden (No. 30), and Triomphe de Gand. The Duncan is attracting attention on account of its earliness and richness, and the Monarch of the West for its size and productiveness.

THE PRESERVATION AND RIPENING OF FRUITS.

In regard to the preservation and ripening of fruits there is very little new to be reported. The conditions of success are now pretty well understood. Our farmers who raise apples in large quantities know how to do it; but with delicate fruits, such as the pear and grape, more care is requisite.

The ripening of fruit depends on saccharine fermentation: this is followed by other fermentations, as the vinous and acetous. To prevent these, and preserve fruit in all its beauty, freshness, and flavor, the temperature must be uniform, and kept below the degree at which the fermentation, or ripening process, commences. Mr. Robert Manning in his prize essay many years ago said, "The ripening of fruit is the completion of the chemical process by which starch is transformed into sugar, and is the first step toward fermentation or decay: therefore whatever promotes fermentation will hasten the ripening; whatever retards fermentation will tend to its preservation."

The conditions of success may be briefly stated as follows: *The perfect control of temperature, light, and moisture.* Numerous structures have been built both in our own and other countries for this purpose; and all experience shows that these conditions must be complied with, or success cannot be

attained: hence these apartments must be cool, and constructed so as to exclude at pleasure the external atmosphere, which starts fermentation. After many years of experience, both with and without the use of ice, I have adopted a house built in a cool, shady aspect, with door on the north, and with a thoroughly drained and cemented cellar whose windows may be opened or closed at pleasure. In this way I am enabled to keep my late fall and winter pears until February or March in good condition. Apples may be kept at a lower temperature than pears, say thirty-four to forty degrees. In such a cellar, our associate member, Mr. John F. Brown of Lunenburg, has kept Baldwins to the middle of June, when he has realized as high as from six to nine dollars per barrel. Mr. Brown barrels his apples, and places them immediately in his cellar, where he has control of the temperature.

Late fruits may remain on the trees until severe frosts are feared, but should be gathered with great care. Summer pears should be picked some days before the ripening process commences. A summer pear ripened upon the tree is generally inferior. In respect to the latter Mr. Patrick Barry has so aptly expressed my own opinion, that I use his language: "The process of ripening on the tree, which is the natural one, seems to act upon the fruit for the benefit of the seed, as it tends to the formation of woody fibre and farina. When the fruit is removed from the tree, at the commencement of ripening, and placed in a still atmosphere, the natural process seems to be counteracted; and sugar and juice are elaborated instead of fibre and farina." Thus pears which become mealy, and rot at the core, if left on the tree to ripen, are juicy, melting, and delicious when ripened in the house. In regard to the use of ice, I would say, that, where fruits are kept for some months under its influence at a low temperature, they seem to lose much of their flavor: the cellular tissue also seems to have become dry, and to have lost its vitality, or power to resume the ripening process. Experience proves, that, for the common varieties of the pear, about forty degrees of Fahrenheit is the temperature best suited to hold this process in equilibrium. The proper maturing of fruit thus preserved demands skill and science. Different varieties require different degrees of moisture and heat accord-

ing to the firmness of the skin, the texture of the flesh, and the natural activity of the juices. Thus some varieties of the pear will ripen at a low temperature and in a comparatively dry atmosphere, while others are improved by a warm and humid air. Some varieties of the pear ripening with difficulty, and formerly esteemed only second-rate, are now pronounced of excellent quality, because the art of maturing them is better understood. Great improvement has taken place in the handling, packing, and preservation of fruits; so that they are delivered in perfect condition from distant places, every class of fruit having its suitable style of package. This remark also applies to the packing of trees for foreign countries; so that trees shipped by Ellwanger & Barry, Rochester, N.Y., to Australia, after one hundred and fifty-three days, arrived in good condition. So well is the art of keeping grapes now understood, that we have the Concord from Fitchburg and other towns in that vicinity, and from New Hampshire, in such fine order as to command twenty-five cents per pound in December and January.

The pear-tree blight has been more prevalent in several localities around Boston, for the last two years, than ever before, and we are as much in the dark as to the cause and remedy as are others; but we trust, that, like former visitations of this malady, it will prove only temporary. In some instances the apple has been affected in the same manner.

In closing this Report I beg to state that the importance of the fruit-crop of Massachusetts has not been fully appreciated. Of the apple alone the returns of 1874 gave us 3,252,057 bushels, valued at $1,450,252; Worcester County having produced in the same year 933,013 bushels, valued at $380,000. Similar results have been realized in other sections of the State, not only with the apple, but with other fruits.

When we reflect on what Massachusetts has done for the cause of American pomology in the last half-century, I think we should feel well satisfied. We would not claim for her any undue share of merit; but if the Massachusetts Horticultural Society had done nothing more than to introduce and disseminate the Bartlett pear (although of foreign origin), if she had done no more than to produce from her rocky soil the Baldwin, Roxbury Russet, Williams, and Hubbardston Nonesuch apples, the Concord grape, and last, not least, the

Dana's Hovey and Clapp's Favorite pear, her name would be honorably associated with those of her sister states in the progress of fruit-culture on our continent. Other states and societies have done nobly; but Massachusetts, as a pioneer in the early history of our pomology, has wielded a strong influence. Strike out from our catalogues the fruits which Massachusetts has introduced from Europe; root out from our orchards, gardens, and vineyards the fine native fruits which have originated in our cold and rough soil,—and we should require a long list of valuable kinds to fill their place. Massachusetts has more good fruits stored up in the laboratory of her resources. Her mission is not yet ended. Let us help her to fulfil it.

The Report was accepted.

Professor Goessmann then submitted his

FIFTH ANNUAL REPORT ON FERTILIZERS.

To the State Board of Agriculture.

Gentlemen,— The consumption of commercial fertilizers has been quite remarkable during the past year. An unusu ally large variety of more or less compound articles has been offered for sale, many of them of excellent quality, and at a fair price; showing a commendable zeal on the part of manufacturers and dealers to meet the wants of a progressive movement of a large portion of their patrons. Careful observers cannot fail to notice the rapid progress among our farmers regarding a better appreciation of the proper position of the commercial fertilizers in a rational system of manuring farm-lands. Our present more intelligent mode of selling fertilizers has largely contributed to these gratifying results. To know the constituents of our manures is not less important for the development of a rational and thus economical system of agriculture than to know the constituents of the soil, and those of the plants we cultivate. An intelligent statement concerning the general character and the chemical composition of the proximate constituents of most fertilizers offered for sale is, for obvious reasons, indispensable in the interest of its rational and thus most success-

ful application, — a point which ought to concern the dealer, although for other reasons, not less than the farmer who uses them. Our laws for the regulation of the sale of fertilizers have also equally aided in bringing about a better understanding between responsible dealers and our farmers, by clearly distinguishing between the responsibility of both parties in a sale. The best proof of the accomplishment of that object, as far as reasonably can be expected in so short a time, can be found in a more general satisfaction among intelligent farmers, with the quality and the price of the fertilizers they bought. In view of these encouraging facts, it remains a matter of regret that all fertilizers which are sold at a price not exceeding fifteen dollars per ton can be sold without any particular obligation on the part of the dealers in these articles, either to guarantee a stated composition, or to give information concerning their proximate constituents; rendering it thus, as a general rule, impossible to form an intelligent opinion about their mode of action and their real merits. Their apparent cheapness as compared with most standard ammoniated superphosphates — which is quite frequently made more conspicuous by irresponsible advertisements regarding their superiority over more costly compounds, for the production of specified crops, &c. — gives them, in the opinion of less discriminating parties, more prominence than they in most instances deserve. This class of fertilizers is quite numerous, and capable of unlimited extension, particularly in large cities, and in centres of commerce and of manufacturing industry. The commercial management of these articles proves, in many instances, a source of annoyance to the licensed branch of the trade, and threatens to become a serious impediment in the development of an intelligent system of manuring, if left unchecked by suitable fair restrictions regarding their sale, similar to those which apply to the higher priced fertilizers. In making these statements I do not dispute the usefulness of many of the compositions which I had in view when writing the previous remarks; but I consider the exceptional position they occupy — being sold without any thing like a responsibility on the part of the manufacturers and dealers — undesirable, on account of the unusual chance they present for unfair dealings; leaving, to say the least, all the risks on the side of the

purchaser. Believing the interests involved of sufficient magnitude to deserve more than a passing notice, I take the liberty of inviting your attention to the subject under discussion, for the purpose of considering whether it would be advisable to cause such alterations in our present laws for the regulation of the sale of fertilizers, as would meet the requirements for a satisfactory adjustment of the rights of all parties concerned.

The prices of most articles used for fertilizing purposes have varied but little, during the past year, from those of the preceding year. The present indications are, that but little change may be expected at the opening of the coming season.

The following statements of prices are mainly based on the ruling wholesale and retail market-prices during the past year in Boston and New-York cities.

Some dealers have published valuations of their own, to show the advantages they offer to their customers. Wherever they are of a general interest, they have been mentioned in connection with the description of the fertilizers they refer to. Our farmers do well to render themselves familiar with the market-prices of our fertilizing materials, and to study statements like the following: —

I.

	Price per pound. in cents.
I. *Nitrogen.* In form of ammonia and nitric acid	25
In form of dried ground meat and blood, finely pulverized steamed bones, finely ground fish-guano, Peruvian guano, urates, poudrettes, and artificial guano	20 to 21
In form of fine ground bones, fine ground horn, and wool-dust	18
In form of coarsely ground bones, horn-shavings, and woollen rags, human excretions, and barnyard-manure, fish-scraps, animal refuse-matter from glue factories and tanneries, &c.	15
II. *Phosphoric Acid soluble in water.* As contained in alkaline phosphates and superphosphates	12.5
In Peruvian guano and urates	9
In form of so-called reduced or reverted acid	9
In precipitated bone-phosphate, steamed fine bones, fish-guano, according to size and disintegration	6 to 7
In form of bone-black waste, wood-ash, Caribbean guano, ground bone-ash, coarsely ground bones, poudrette, barnyard-manure, &c.	5
In form of finely ground South Carolina and Navassa phosphates	3.5

	Price per pound, in cents.
III. *Potassium Oxide.* In form of muriate of potash or chloride of potassium	6
In form of sulphate of potassa in kainits	7.5
In form of higher grades of sulphate of potassa	9

II.

NAME OF MATERIAL.	Price per ton of 2,000 pounds, in Dollars.	Price per pound in case of from 100 to 200 pounds, in Cents.
Sulphate of Ammonia, containing from 24 to 25 per cent of ammonia	90–95	4–5
Nitrate of Soda (Chili saltpetre), containing 95 per cent of that compound	70–78	4–4.5
Nitrate of Potassa, containing 94 to 96 per cent of that compound	165-170	9–9.5
Dried Blood, yielding from:—		
(*a*) 12 to 14 per cent of ammonia	50	3
(*b*) 10 to 12 per cent of ammonia	45	2.8
Dried Meat, yielding from 14 to 15 per cent of ammonia	50	3
Fine-ground Bones, containing from 22 to 24 per cent phosphoric acid, and yielding from 3.5 to 4.5 per cent of ammonia	35–40	2.5
Bone-black (waste material), containing from 30 to 34 per cent of phosphoric acid	28–30	1.5
Superphosphate of Lime, containing from 15 to 16 per cent of soluble phosphoric acid	32–35	2
Muriate of Potash, containing from 80 to 85 per cent of that compound, equal 50 to 53.7 per cent of potassium oxide	45–50	3
Sulphate of Potassa, containing 80 per cent of that compound, which is equal to 43.3 per cent of potassium oxide	65	4
Sulphate of Potassa, containing from 60 to 65 per cent of that compound, which is equal to from 32.3 to 35 per cent of potassium oxide	58–60	3.5
German Potash Salt, containing from 28 to 32 per cent of sulphate of potassa, which is equal to from 15 to 17.3 per cent of potassium oxide	25	1.25
Kainit, low grade, containing from 22 to 26 per cent of sulphate of potassa, which is equal to from 11.9 to 14 per cent of potassium oxide	18–20	1
Sulphate of Magnesia (Kieserite), containing 55 per cent of that compound	14–15	0.8
Sulphate of Magnesia (Kieserite), containing from 60 to 70 per cent of that compound	20–25	1.25–1.50
Fine-ground Gypsum, containing from 95 to 98 per cent of that compound	9–10	0.5

I.

Potash-Salts.

The importation of the German potash-salts has been again larger during the past than the previous years. Among the high grades, the muriate of potash has been most extensively used, on account, apparently, of its reliable character during the past, as well as by its comparatively low price. The high grades of the sulphates of potassa have been largely supplied by home-manufactured articles, produced from the muriate of potash by means of sulphuric acid. It is to be regretted, in the interest of our present state of agricultural investigations, that higher grades of potash-salts — containing a liberal percentage of sulphate of magnesia, instead of chloride of sodium, or sulphate of soda — are not offered for sale in desirable quantities and at acceptable prices. The prospect held out at an early period of the present year, to offer an article for sale before the close of season which would contain 80 per cent of muriate of potash and 10 per cent of sulphate of magnesia, has not been realized. Muriate of potash, containing from 80 to 85 per cent of that compound, which is equal to from 50 to 53.5 per cent of potassium oxide, has been sold at from forty-five to fifty dollars per ton of two thousand pounds; in retail, at three cents per pound.

Muriate of Potash.

	Per cent.
Potassium oxide	53.50
Sodium oxide	6.37
Insoluble matter	.20
Moisture	2.00

This sample consisted of 85 per cent of chloride of potassium and 12.4 per cent of chloride of sodium, and is thus a very good specimen of its kind.

Sulphate of Potassa.

	Per cent.
Potassium oxide	36.89
Sodium oxide	.34
Sulphuric acid	44.60
Insoluble matter (in acids)	.60
Moisture	1.60

The sample was represented to contain 36 per cent of potassium oxide, or 66.5 per cent of sulphate of potassa. It is a product of home manufacture. Both samples were collected of Messrs. W. H. Bowker & Co., Boston, Mass. Sulphate of potassa, containing 80 per cent of that compound, which corresponds to 43.3 per cent of potassium oxide, has been sold at sixty-five dollars per ton of two thousand pounds; in small quantities, at four cents per pound. Samples like the above, containing from 60 to 65 per cent of the sulphate of potassa, have been sold at from fifty-eight to sixty dollars per ton, and at three cents and a half per pound. German potash-salts, containing from 22 to 26 per cent of sulphate of potassa, have been offered in the market at twenty-five dollars per ton; whilst low-grade kainits, containing from 22 to 26 per cent of sulphate of potassa, sold at from eighteen to twenty dollars per ton.

Magnesia containing German Potash-Salt (Kainit).

	Per cent.
Potassium oxide	11.70
Sodium oxide	18.97
Magnesium oxide	9.01
Calcium oxide (lime)	3.29
Sulphuric acid	17.96
Chlorine	34.32
Insoluble matter	2.37
Moisture	5.00

Salines like the above sample, are, in most cases, safest applied in the autumn, or in the earlier part of the spring: they produce, like all German potash-salts, as a general rule, more satisfactory results upon a loamy soil than upon either a clayish or sandy soil. The native Leopoldhall kainit has of late largely been used in Germany in place of the lower grades of so-called artificial kainits, and with good results. It has been noticed, that, in case of an early application, its objectional large amount of chlorides passes rapidly, with or without a previous transformation, into the subsoil, aiding thereby in the diffusion of the potassa present. For deep-rooting forage-plants are the kainits in particular recommended.

Stable Potash Purifier.

	Per cent.
Potassium oxide	6.45
Sodium oxide	14.84
Calcium oxide	9.72
Magnesium oxide	9.40
Sulphuric acid	22.01
Chlorine	24.40

This article has been offered for sale by the General Potash-Salt Depot, No. 120 Liberty Street, New-York City, at thirty-three dollars per ton of two thousand pounds, and at five dollars and a half per barrel of two hundred and fifty pounds. The proprietors recommend its application as an efficient absorber of the ammonia in stables, — an effect which it is well qualified to accomplish, if properly applied. The well-known peculiar re-action of some of its essential constituents, as the chlorides of sodium and magnesium, on plant-growth and on soil, renders it advisable to study carefully its influence on the action of the manures treated with it, before using the substance in a liberal degree. The stable potash purifier contained about 24 per cent of chloride of sodium, or common salt, and 17 per cent of chloride of magnesium, besides 10.2 per cent of chloride of potassium.

Crude Sulphate of Magnesia (*Kieserite*).

	Per cent.	
	I.	II.
Magnesium oxide	21.10	16.53
Calcium oxide	3.89	Not det.
Sulphuric acid	44.42	31.91
Chlorine	5.09	18.64
Insoluble in water	5.00	11.06
Insoluble in acids	4.98	–
Moisture	8.20	26.80

Sample No. I. was obtained of a dealer in Boston; No. II., of a dealer in New-York City. The former, containing from 60 to 65 per cent of sulphate of magnesia, sold at from twenty to twenty-five dollars per ton; the latter, containing from 50 to 55 per cent of that compound, was offered for sale at from fourteen to fifteen dollars per ton. The use of the crude sulphate of magnesia in part, in place of sulphate of lime, as a superior material for the absorption of ammonia

and soluble phosphoric acid, in decomposing animal excretions, seems to engage gradually a deserved attention.

Sulphate of Ammonia.

	Per cent. I.	Per cent. II.
Ammonia	25.49	25.14
Sulphuric acid	60.43	59.60
Moisture	1.80	2.40
Sand, &c.	Trace.	Trace.

Both samples are good representatives of the kind generally noticed in our markets. No. I. was secured of Messrs. W. H. Bowker & Co. in Boston; No. II. was stated to be obtained from Mr. G. White of New York. The peculiar odor of the latter indicated that it was obtained, as by product, in the charring of animal matter. The former, like most of our articles of this substance, came from the ammoniacal waters of the gas-works. Sulphate of ammonia of the above description has sold in the wholesale trade as low as eighty dollars per ton of two thousand pounds. In the retail trade the price, at the beginning of the spring, has been recorded from eighty-five to ninety dollars per ton; in case of small quantities, not exceeding from one hundred to two hundred pounds, from four cents and a half to five cents per pound.

Crude Nitrate of Soda (*Chili saltpetre*).

	Per cent.
Nitric acid	60.67
Sodium oxide	35.00
Chlorine	1.70
Moisture	1.10
Calcium oxide	Traces.
Sulphuric acid	Traces.

These analytical statements prove that the article fully corresponds with the adopted standard — 95 per cent of nitrate of soda — of the Peruvian Government. Nitrate of soda, containing 95 per cent of that compound, has been sold at from seventy to seventy-eight dollars per ton: from four to four and a quarter cents has been asked for the pound. As 95 per cent of that compound contains 15.6 pounds of nitrogen, the latter has been sold at twenty-five cents per pound. Judging from previous observation, it seems that

the manufacture of the Chili saltpetre, under the control of the government, is quite satisfactorily managed.

Dried Blood.

	Per cent. I.	II.	III.
Nitrogen	8.51	10.13	12.50
Phosphoric acid	2.56	10.00	12.50
Total ash	7.20	10.00	12.50
Moisture	37.34	12.90	20.00

The dried blood serves almost exclusively as a nitrogen source in compound fertilizers: it is for that purpose one of the most valuable animal substances, on account of its rapid formation of ammonia. The above analyses represent largely the various qualities of dried blood used by our fertilizer manufacturers. The price of these samples, according to quality, has varied from forty to fifty dollars per ton. Most of the blood of our large butcheries in the Eastern States is worked up in the so-called "Animal Dust," which of later years has acquired a deserved high reputation among our home-made commercial fertilizers. Western cities supply largely our markets with dried blood.

Animal Dust.

I.

Brighton Animal Dust.

(Messrs. Bowker & Co., Boston.)

	Per cent.
Volatile and organic animal matter	71.00
Ash constituents	28.90
Moisture	11.50
Phosphoric acid in ash	11.26
Nitrogen in organic matter	6.84
Insoluble matter	.56

Valuation per ton of two thousand pounds: —

225.2 pounds of phosphoric acid	$13.51
136.8 pounds of nitrogen	28.73
	$42.24

II.

Brighton Animal Dust.

(Messrs. Hovey & Co., Boston.)

	Per cent.
Volatile and organic animal matter	70.00
Ash constituents	29.40
Moisture	10.28
Phosphoric acid in ash	11.94
Nitrogen in animal matter	8.07
Insoluble matter	2.00

Valuation per ton of two thousand pounds:—

223.8 pounds of phosphoric acid	$14.33
161.4 pounds of nitrogen	33.89
	$48.22

III.

Animal Fertilizer with Potash.

(Manufactured by Messrs. L. B. Darling & Co. of Pawtucket, R.I.; collected of Messrs. Bagg & Batchelder of Springfield, Mass.)

	Per cent.
Volatile and organic animal matter	56.50
Ash constituents	43.50
Moisture	6.36
Nitrogen in organic matter (= 10.3 $N.H._3$)	8.58
Phosphoric acid in ash	9.40
Potassium oxide	5.07
Insoluble matter	1.60

Valuation per ton of two thousand pounds:—

171.6 pounds of nitrogen	$36.04
112.8 " of phosphoric acid	11.28
101.4 " of potassum oxide	6.08
	$55.40

These three animal fertilizers were of a good mechanical condition; and the analytical results correspond very satisfactorily with the represented composition of their respective manufacturers. The presence of a considerable amount of potassium oxide in No. III. cannot fail to increase the chances of success wherever potassa is but in limited quantities in the soil,—a circumstance not unfrequently met with.

Bones.

I.

Fine Bones of Messrs. L. B. Darling & Co. of Pawtucket, R.I.

(Messrs. Clark & Son, Worcester, Mass.)

	Per cent.
Moisture and organic matter	45.00
Ash constituents	55.00
Moisture at 100° to 110° C.	4.71
Total nitrogen in organic matter	4.51
Insoluble matter	1.30

II.

Brighton Steamed Bones.

(Messrs. Bowker & Co., Boston, Mass.)

	Per cent.
Moisture and organic matter	41.40
Ash constituents	58.60
Moisture at 100° to 110° C.	6.15
Total nitrogen in organic matter	3.89
Total phosphoric acid in ash	24.96
Insoluble matter	.14

III.

Fine Bones of G. B. Root of Northborough, Mass.

(Messrs. J. & J. A. Rice, Worcester, Mass.)

	Per cent.
Moisture and organic matter	47.30
Ash constituents	57.70
Moisture at 100° to 110 C.	9.01
Total nitrogen	4.39
Total phosphoric acid	21.67
Insoluble matter	.92

These samples of ground bones represent the average composition of good pure articles of their kind: their composition varies within the usual limits of more or less moderately rendered bones. The texture and the general appearance of No. III. makes it doubtful whether it has been rendered at all; it was also somewhat coarser than Nos. I. and II. The retail price of ground bones has been from forty to fifty dollars per ton of two thousand pounds.

Brighton Dissolved Bone-Black.

(Messrs. W. H. Bowker & Co., Boston, Mass.)

	Per cent.
Total phosphoric acid	17.07
Soluble " "	13.42
Insoluble " "	3.65
Moisture	11.70

Valuation per ton of two thousand pounds: —

268.4 pounds soluble phosphoric acid	. . . .	$33.55
73 " insoluble " "	. . . .	3.65
		$37.20

Bone-black refuse, containing from 30 to 34 per cent of insoluble phosphoric acid, has been offered at from twenty-eight to thirty dollars per ton of two thousand pounds, which makes the price per pound of insoluble phosphoric about five cents in waste bone-black. On a former occasion I stated that coarse articles of that kind are best changed into superphosphates to secure remunerative results, in consequence of their application to farm-lands. Waste bone-black in form of dust, if applied to soil which is rich in decaying organic matter, is, however, known to produce quite satisfactory results. As the rate at which a finely-ground bone-black may yield, under favorable conditions, its insoluble phosphoric acid to the dissolving action of carbonic acid containing soil-water, is a question quite frequently asked, I enter here on record the results of an actual experiment of Mr. Monroe Morse of Franklin, Mass., which came under my notice. Four pounds of bone-black-dust were mixed with from ten to twelve times their weight of a compost of wool-waste and loam. This mixture, for the purpose of protecting it against the action of rain, &c., was filled into a cask, full of small holes to allow a free access as well as escape of gases formed, and subsequently buried in a pile of the previously described compost, which served for the mixture. The cask was filled and buried on the 15th of January, 1877, and its contents tested by me, at the request of Mr. Morse, in the beginning of March. I found that from 23 to 24 per cent of the entire amount of phosphoric acid was present in the state known as reverted acid, soluble in carbonic acid containing water, or a solution of ammonia compounds, and thus at once available to plants. Many recent experiments at home and abroad indorse the practice of composting fine-ground mineral phosphates for some months with fecal barnyard-manure, as a very efficient course to secure, in an economical way, active phosphoric acid for the successful production of our farm-crops.

Peruvian Guano.

I.

Rectified Peruvian Guano.

(Manufactured by Messrs. Hobson, Hurtado, & Co., New-York City, and collected of Messrs. Bowker & Co., Boston Mass.)

	Per cent.
Moisture at 100° C.	10.50
Soluble phosphoric acid	11.01
Reverted " "	1.83
Insoluble " "	1.06
Potassium oxide	2.37
Nitrogen (which is equal to 9.72 ammonia)	8.00

The composition of this article corresponds quite satisfactorily with the guaranteed amount of its constituents. This "Rectified Guano" was offered for sale at sixty-five dollars per ton of two thousand pounds. Its valuation is based on the following rates by the manufacturer: —

	Cents per pound.
For ammonia	20
Or nitrogen	24–25
Soluble phosphoric acid	10
Reverted " "	8
Insoluble " "	–
Potassium oxide	7.5

II.

Warranted No. I. Peruvian Guano.

(Collected of Messrs. J. & J. A. Rice, Worcester, Mass.)

	Per cent.
Moisture at 100° C.	7.82
Nitrogen (equal to 10.10 ammonia)	8.32
Phosphoric acid	14.00
Potassium oxide	2.40

III.

Warranted No. I. Peruvian Guano.

(Collected of Messrs. Bagg & Batchelder of Springfield, Mass.)

	Per cent.
Moisture at 100° C.	20.14
Nitrogen (equal to 9.8 per cent of ammonia)	8.06
Phosphoric acid	18.59
Potassium oxide	1.70

Samples No. II. and III. are sold at sixty dollars per ton of twenty-two hundred and forty pounds: they are desig-

nated "Crude Guano," and are usually sold in their original packages as imported from Peru. The following three things are guaranteed to its purchasers: —

First, That the article is pure and genuine Peruvian guano.

Second, That it has not been damaged by sea-water.

Third, That it will average 10 per cent of ammonia, allowing a variation of from 9.5 to 10.5 per cent of that compound.

This guano is known to dealers as "Standard Guano." Both samples, although differing in some particulars, were in conformity with the three conditions guaranteed.

IV.

No. I. Peruvian Guano.—Lobos.

(Collected of Messrs. C. L. Bartlett & Co., Boston, Mass.)

	Per cent.
Moisture at 100° C.	11.78
Nitrogen (equal to 7.15 per cent of ammonia)	5.96
Phosphoric acid	16.24
Potassium oxide	2.23

This quality of guano is sold at fifty-six dollars per ton of two thousand pounds, which is a fair price at the present condition of our fertilizer market.

V.

No. II. Peruvian Guano.

(Collected of Messrs. C. L. Bartlett & Co., Boston, Mass.)

	Per cent.
Moisture at 100° C.	12.66
Nitrogen (equal to 4.16 per cent of ammonia)	3.43
Phosphoric acid	13.58
Potassium oxide	1.30

The price of this kind of Peruvian guano has been thirty-eight dollars per ton of two thousand pounds, which is a quite reasonable charge, considering our general market-prices. As the system of selling Peruvian guano has been greatly changed of late, in consequence of the introduction of selling by analysis, and with a guaranty of the stated composition of the articles offered for sale, I consider it in the interest of a safer purchase on the part of those who wish to use Peruvian guano to insert here a passage from

a commercial circular of the agents of the Peruvian Government for the United States, — Messrs. Hobson, Hurtado, & Co., of New-York City, No. 63 Pine Street, — which contains the future basis of sale: —

"BRANDS OF GUANO.

"The following are the brands or designation under which guano is placed on the market: —

"No. I. Peruvian guano, 'Standard,' or 'Guanape.'
No. I. Peruvian guano, 'Lobos.'
No. I. Peruvian guano, 'Guaranteed.'
No. I. Peruvian guano, 'Rectified.'
No. II. Peruvian guano.

"As we have said before, each and all of these are genuine pure guanos, with the exception of No. 1. Rectified, which is guano treated by sulphuric acid as will further on be explained. [See, for details, my previous reports, II. in particular. — G.] These guanos are all put up in burlap bags, bearing on one side the following lettering: —

"'Warranted No. — Peruvian
Guano,
Imported into the
U. S. by
Hobson, Hurtado, & Co.,
Agents
for the
Consignees of the
Peruvian Government.'

"On the other side of the bag will be found the marks that will enable the purchaser to distinguish to which brand each bag belongs, and which we shall proceed to describe under the heading of the respective kind."

For further particulars I have to refer to the circular, which, it must be conceded, discusses its subject in an able and an exhaustive manner. *Farmers do well to look for the analytical statements of the guaranteed composition; for the latter will vary from time to time; and thus not less the price will differ even for the same brands or designations under which the guanos are placed on the market.*

Ammonia in Peruvian guano, with the exception of the "rectified," is charged seventeen cents and a half per pound; phosphoric acid, entire amount present, nine cents per pound; potassa, entire amount present, seven cents and a half per pound.

Ammoniated Superphosphates.[1]

I.

Enoch Coe's Ammoniated Superphosphate.

(E. J. Jones, Esq., Greenfield, Mass.)

	Per cent.
Total phosphoric acid	11.47
Soluble " "	9.91
Reverted " "	9.00
Insoluble " "	1.56
Nitrogen	2.97
Moisture at 100° C.	23.50

Valuation per ton of two thousand pounds:—

198.2 pounds of soluble phosphoric acid	$24.77
31.6 " insoluble " "	1.89
59.4 " nitrogen	12.48
	$39.14

II.

Frank Coe's Ammoniated Superphosphate.

(John J. Clark, Esq., Worcester, Mass.)

	Per cent.
Total phosphoric acid	11.40
Soluble " "	8.58
Reverted " "	1.06
Insoluble " "	1.76
Nitrogen	2.68
Moisture at 100° C.	25.94

Valuation per ton of two thousand pounds:—

171.6 pounds of soluble phosphoric acid	$21.45
21.2 " reverted " "	1.91
35.2 " insoluble " "	2.11
53.6 " nitrogen	11.26
	$36.73

[1] In my last report (IV.) was published an analysis of Ammoniated Superphosphate of Messrs. O. Foote & Co., which does not apply to that article as offered for sale in the general market. My sample was collected in the storehouse of Messrs. W. H. Bowker & Co., where it served for the manufacture of more compound fertilizers; a fact which came to my knowledge too late to prevent the mistake. I have no reason to doubt that the fertilizer sold under that name by the successors in the business, Messrs. H. B. Arnold & Co. of Boston, corresponds in its composition with the analytical statement which accompanies each package.

III.

Lawn-Dresser of Messrs. W. H. Bowker & Co., Boston, Mass.

	Per cent.
Total phosphoric acid	5.95
Soluble " "	5.76
Reduced " "	.19
Nitrogen	8.91
Potassium oxide	4.50
Moisture	5.40

Valuation per ton of two thousand pounds: —

115.2	pounds of soluble phosphoric acid	$14.40
3.8	" reverted " "	.34
90.0	" potassium oxide	13.50
178.2	" nitrogen	37.42
		$65.66

IV.

Mr. Enoch Coe's Ammoniated Superphosphate (1876).

(E. J. Jones, Esq., Greenfield, Mass.)

	Per cent.
Total phosphoric acid	14.84
Soluble " "	9.98
Reverted " "	1.66
Insoluble " "	3.20
Nitrogen	2.78
Moisture at 100° C.	20.61

Valuation per ton of two thousand pounds: —

199.6	pounds of soluble phosphoric acid	$24.95
33.2	" reverted " "	2.99
64.0	" insoluble " "	3.84
55.6	" nitrogen	11.68
		$43.46

V.

Messrs. William L. Bradley & Co.'s Ammoniated Superphosphate (XL).

(Messrs. J. & J. A. Rice of Worcester, Mass.)

	Per cent.
Total phosphoric acid	12.64
Soluble " "	7.11
Reverted " "	1.80
Insoluble " "	3.70
Nitrogen	2.52
Moisture at 100° C.	19.30

Valuation per ton of two thousand pounds:—

142.2	pounds of	soluble phosphoric acid	$17.77
36.0	"	reverted " "	3.24
74.0	"	insoluble " "	4.44
50.4	"	nitrogen	10.58
			$36.03

VI.

Messrs. William L. Bradley & Co.'s Ammoniated Superphosphate (XL).

(Messrs. Bagg & Batchelder, Springfield, Mass.)

	Per cent.
Total phosphoric acid	12.71
Soluble " "	7.81
Reverted " "	.50
Insoluble " "	4.40
Nitrogen	2.84
Moisture at 100° C.	23.12

Valuation per ton of two thousand pounds:—

156.2	pounds of	soluble phosphoric acid	$19.52
10.0	"	reverted " "	.90
88.0	"	insoluble " "	5.28
56.8	"	nitrogen	11.93
			$37.63

VII.

Messrs. William L. Bradley & Co.'s Sea-Fowl Guano.

(Messrs. Bagg & Batchelder, Springfield, Mass.)

	Per cent.
Total phosphoric acid	11.20
Soluble " "	6.00
Reverted " "	.85
Insoluble " "	4.35
Potassium oxide	.58
Nitrogen	2.73
Moisture	11.20

Valuation per ton of two thousand pounds:—

120.00	pounds of	soluble phosphoric acid	$15.00
17.00	"	reverted " "	1.53
87.00	"	insoluble " "	5.22
11.60	"	potassium oxide	.70
54.60	"	nitrogen	11.47
			$33.92

VIII.

Messrs. William L. Bradley & Co.'s Patent Superphosphate.

(Messrs. J. & J. A. Rice of Worcester, Mass.)

	Per cent.
Total phosphoric acid	11.60
Soluble " "	7.30
Reverted " "	.62
Insoluble " "	3.68
Nitrogen	3.27
Moisture	17.88

Valuation per ton of two thousand pounds: —

146.0 pounds of	soluble phosphoric acid	$18.25
12.4 "	reverted " "	1.12
73.6 "	insoluble " "	4.42
65.4 "	nitrogen	13.74
		$37.53

IX.

Messrs. William L. Bradley & Co.'s Original Coe's Superphosphate.

(Messrs. J. & J. A. Rice of Worcester, Mass.)

	Per cent.
Total phosphoric acid	12.29
Soluble " "	7.40
Reverted " "	.34
Insoluble " "	4.54
Nitrogen	2.78
Moisture at 100° C.	20.34

Valuation per ton of two thousand pounds: —

148.0 pounds of	soluble phosphoric acid	$18.50
6.8 "	reverted " "	.60
90.8 "	insoluble " "	5.45
55.6 "	nitrogen	11.68
		$36.24

X.

Pine-Island Guano, Cuinnipiac Fertilizer Co., New Haven, Conn.

(Mr. H. Phelps, Northampton, Mass.)

	Per cent.
Total phosphoric acid	6.62
Soluble " " }	5.25
Reverted " " }	
Insoluble " "	1.37
Nitrogen	4.55
Potassium oxide	1.70
Moisture at 100° C.	20.11

Valuation per ton of two thousand pounds:—

132.2	pounds of	phosphoric acid	$11.90
91.0	"	nitrogen	19.11
34.0	"	potassium oxide	2.45
			$33.46

XI.

Soluble Nitrogenous Phosphate, Cuinnipiac Fertilizer Co., New Haven, Conn.

(Mr. H. Phelps, Northampton, Mass.

	Per cent.
Total phosphoric acid	11.22
Soluble " "	7.04
Reverted " "	.54
Insoluble " "	3.64
Potassium oxide	1.20
Nitrogen	3.59
Magnesium oxide	1.20
Moisture	21.60

Valuation per ton of two thousand pounds:—

140.8	pounds of	soluble phosphoric acid	$17.60
10.8	"	reverted " "	.97
72.8	"	insoluble " "	4.37
71.8	"	nitrogen	15.08
24.0	"	potassium oxide	1.80
			$39.82

XII.

Bay-State Superphosphate of Mr. J. A. Tucker, Boston, Mass.

(Messrs. Breck & Co., Boston, Mass.)

	Per cent.
Total phosphoric acid	12.95
Soluble " "	10.90
Reverted " "	.38
Insoluble " "	1.67
Nitrogen	2.94
Potassium oxide	.36
Moisture at 100° C.	12.22

Valuation per ton of two thousand pounds:—

218.0	pounds of	soluble phosphoric acid	$27.25
7.6	"	reverted " "	.68
33.4	"	insoluble " "	2.01
58.8	"	nitrogen	12.34
7.2	"	potassium oxide	.54
			$42.82

XIII.

Mr. Russel Coe's Ammoniated Superphosphate.

(Messrs. J. & J. A. Rice of Worcester, Mass.)

	Per cent.
Total phosphoric acid	13.31
Soluble " "	7.42
Reverted " "	.84
Insoluble " "	5.05
Nitrogen	2.77
Moisture at 100° C.	22.65

Valuation per ton of two thousand pounds: —

148.40 pounds of soluble phosphoric acid	$18.55
16.80 " reverted " "	1.51
101.00 " insoluble " "	6.06
55.40 " nitrogen	11.63
	$37.75

XIV.

Messrs. L. B. Darling & Co.'s Lawn-Dresser.

(Messrs. Gannet & Co., Boston, Mass.)

	Per cent.
Total phosphoric acid	11.81
Nitrogen	6.00
Potassium oxide	8.82

Valuation per ton of two thousand pounds: —

236.2 pounds of phosphoric acid	$14.17
120.0 " nitrogen	25.20
176.4 " potassium oxide	10.58
	$49.95

XV.

Matfield's Fruiting Strawberry Fertilizer.

(Mr. G. B. Fogg of Boston, Mass.)

	Per cent.
Total phosphoric acid	5.83
Soluble " "	2.42
Reverted " "	2.00
Insoluble " "	1.41
Nitrogen	3.71
Potassium oxide	7.33
Magnesia	.37
Moisture	8.58

Valuation per ton of two thousand pounds: —

48.4 pounds of soluble phosphoric acid	$6.05
40.0 " reverted " "	3.60
28.2 " insoluble " "	1.69
74.2 " nitrogen	15.58
146.6 " potassium oxide	8.79
	$35.71

XVI.

Matfield's Spring-Grass Fertilizer.

(Mr. G. B. Fogg of Boston, Mass.)

	Per cent.
Total phosphoric acid	3.77
Soluble " "	2.24
Reverted " "	–
Insoluble " "	1.52
Potassium oxide	4.50
Nitrogen	4.86
Magnesium oxide	1.10
Moisture at 100° C.	8.90

Valuation per ton of two thousand pounds: —

44.8 pounds of	soluble phosphoric acid	$5.60
30.4 "	insoluble " "	1.83
97.2 "	nitrogen	20.41
90.0 "	potassium oxide	6.75
		$34.59

XVII.

Buffalo Bone Superphosphate of Mr. L. L. Crocker of Buffalo.

(A. Walker, Esq., Williamstown, Mass.)

	Per cent.
Total phosphoric acid	14.30
Soluble " "	9.47
Reverted " "	2.19
Insoluble " "	2.64
Nitrogen	3.39
Moisture at 100° C.	12.10

Valuation per ton of two thousand pounds: —

189.4 pounds of	soluble phosphoric acid	$23.68
43.8 "	reverted " "	3.94
52.8 "	insoluble " "	3.17
67.8 "	nitrogen	14.24
		$45.03

XVIII.

Stockbridge Fertilizer (Wheat).

(Messrs. W. H. Bowker & Co., Boston, Mass.)

	Per cent.
Total phosphoric acid	5.40
Soluble " "	4.86
Reverted " "	–
Insoluble " "	.53
Nitrogen	5.19
Potassium oxide	5.67
Moisture at 100° C.	20.72

Valuation per ton of two thousand pounds: —

97.20	pounds of	soluble phosphoric acid	$12.15
–	"	reverted " "	–
10.60	"	insoluble " "	.64
103.80	"	nitrogen	21.80
113.40	"	potassium oxide	6.81
			$41.40

XIX.

Stockbridge Fertilizer (Rye).

(Messrs. W. H. Bowker & Co., Boston, Mass.)

	Per cent.
Total phosphoric acid	6.91
Soluble " "	5.80
Reverted " "	–
Insoluble " "	1.10
Nitrogen	5.13
Potassium oxide	6.17
Moisture at 100° C.	20.84

Valuation per ton of two thousand pounds: —

116.0	pounds of	soluble phosphoric acid	$14.50
–	"	reverted " "	–
22.0	"	insoluble " "	1.30
102.6	"	nitrogen	21.55
123.4	"	potassium oxide	7.40
			$44.75

XX.

Bowker's Hill and Drill Fertilizer.

(Messrs. W. H. Bowker & Co., Boston, Mass.)

	Per cent.
Total phosphoric acid	14.13
Soluble " "	12.89
Reverted " "	–
Insoluble " "	1.24
Nitrogen	2 67
Moisture at 100° C.	17.08

Valuation per ton of two thousand pounds: —

257.8	pounds of	soluble phosphoric acid	$32.23
–	"	reverted " "	–
24.8	"	insoluble " "	2.23
53.4	"	nitrogen	11.21
			$45.67

FISH-FERTILIZER.

The manufacture of fish-fertilizer on the part of the United-States Menhaden Oil and Guano Association has been somewhat larger during the year of 1877 than during 1876, although the number of working factories has been only fifty-six, instead of sixty-four in 1876. The recently published statistics of that association give the following account of their last year's operations as compared with the preceding one:—

Number of fish caught in 1876 . . .	512,450,000
" " " 1877 . . .	587,624,125
Gain over 1876	75,174,125
Number of barrels (estimated) in 1876 . .	1,708,106
" " " 1877 . .	1,958,747
Gain over 1876	250,581
Number of gallons of oil obtained in 1876 .	2,992,000
" " " " 1877 .	2,426,589
Less than in 1876	565,441
Number of tons of guano made in 1876 . .	51,244
" " " " 1877 . .	55,444
Gain over 1876	4,200

There is a manifest desire on the part of the manufacturers of fish-guano to devise modes of operation by which the fish-refuse may be brought into a more acceptable form. Various patented proeesses are advocated, and will, in all probability, be tried during the coming season. The question of a supply of fish-refuse from other branches of fish-industry—as cod-fish, sardines, &c.—has been discussed; and it is to be hoped that our resources of fish for agricultural purposes will keep up with an increasing demand. In the form of fish we are enabled to return, in part at least, to our lands, what a wasteful sewage-system of our seaport towns sweeps into the ocean. Some enterprising dealers in fish-refuse have prepared compositions with German potash-salts, or kainit, to offer more complete fertilizers. If properly applied, they cannot fail to insure, in many instances, the chanees of success. Composting fish with soil and gypsum, before its use, has given better satisfaction than treating fish with sulphuric

acid to render its nitrogenous matter and bones soluble. Feeding dry fish to farm live-stock engages considerable attention.

I.

Dry Ground-Fish, Cuinnipiac Fertilizer Co., New Haven, Conn.

(Mr. H. Phelps, Northampton, Mass.)

	Per cent.
Total phosphoric acid	7.38
Total nitrogen	8.34
Moisture	15.25

Valuation per ton of two thousand pounds: —

147.6 pounds of phosphoric acid	$8.86
166.8 pounds of nitrogen	35.03
	$43.89

II.

Fish and Kainit, Cuinnipiac Fertilizer Co., New Haven, Conn.

(Mr. H. Phelps, Northampton, Mass.)

	Per cent.
Total phosphoric acid	7.80
Total nitrogen	4.75
Total potassium oxide	3.17
Moisture at 100° C.	22.71

Valuation per ton of two thousand pounds: —

156.0 pounds of phosphoric acid	$9.36
95.0 " nitrogen	19.95
63.4 " potassium oxide	4.76
	$34.07

Ward's Fertilizers.

The material which served for the subsequent two analyses was obtained from Mr. John E. Read of South Amherst, Mass. Both samples, it was stated, had been sold at fifteen dollars per ton of two thousand pounds, besides expenses for cartage. As the price charged for these two articles did not exceed fifteen dollars per ton, they were not subjected to the provisions of our State laws for the regulation of the sale of fertilizers, which oblige the dealers in fertilizers to accompany each package with a statement regarding the amount and the character of its constituents with reference to nitrogen, phosphoric acid, and potassium oxide. To learn the composition of these fertilizers, and to assist Mr. Read in an

intelligent appreciation of their mode of action, induced me to undertake their examination, and to enter my results for the benefit of others here on record.

I.

Ward's Corn-Fertilizer, manufactured by the Ward's Fertilizer Co., Boston, Mass.

(Mr. John E. Read of South Amherst, Mass.)

	Per cent.
Total phosphoric acid	.50
Total potassium oxide	.29
Total nitrogen	Traces.
Calcium oxide (lime)	20.75
Magnesium oxide	.94
Sodium oxide	7.71
Sesqui-oxide of iron	1.50
Sulphuric acid	35 92
Chlorine	4 58
Insoluble matter (in acids)	13.23
Moisture lost at 100° C.	5.38
Loss by calcination at red-heat	12.54

II.

Ward's Carrot-Fertilizer, manufactured bg the Ward's Fertilizer Co., Boston, Mass.

(Mr. John E. Read of South Amherst, Mass.)

	Per cent
Total phosphoric acid	.42
Total potassium oxide	.18
Total nitrogen	Traces.
Calcium oxide (lime)	19.45
Magnesium oxide	.90
Sodium oxide	6.61
Sesqui-oxide of iron	1.18
Sulphuric acid	33.07
Chlorine	5.14
Insoluble matter (in diluted acids)	11.84
Moisture at 100° C.	5.36
Loss by calcination at red-heat	15.70

The fertilizers (I. and II.) consisted of a coarsely-ground mass of gray and white substances, in which large pieces of gypsum, of charcoal, and of white acid salines, could be readily distinguished. The strength of the bags in which they were packed had apparently greatly suffered from the acid re-action of the material. About one-half — from fifty to sixty

per cent — of both fertilizers consisted of gypsum: the remaining portion was, apparently, in the main, ashes, salt, and some acid sulphate of soda. Their conposition proved so much alike, that it is quite safe to assume, that no serious changes in results will be produced in case the carrot-fertilizer should be used for the production of corn, and the corn-fertilizer for that of carrots.

Improved Poudrette.

The material which served for the following analysis was furnished by a gentleman in the eastern part of the State for the purpose of ascertaining the amount of its essential constituents as compared with that of other fertilizers, to secure a basis for an approximate valuation of their respective merits from a merely commercial stand-point.

	Per cent.
Organic and volatile matter	65.60
Ash-constituents	34.42
Moisture at 100° C.	34.58
Nitrogen, partly in form of ammonia	2.00
Total phosphoric acid in ash	2.07
Soluble " " "	1.98
Insoluble " " "	.09
Potassium oxide	.18
Calcium oxide (lime)	7.46
Sulphuric acid	13.03
Matter insoluble in diluted acids	16.62
Chlorides, &c.	Not det.

The article, which, according to information received, came from an establishment near Newark, N.J., was sold at a depot in New-York City at sixteen dollars per ton of two thousand pounds. The price charged for the poudrette fertilizer compares quite satisfactorily with the present market-prices of its essential constituents as specified in the above analytical statement. Its application had produced satisfactory results in the estimation of its purchaser. One of the noticeable features of this fertilizer consists in its large percentages of gypsum, and of earthy, insoluble matter, — from three hundred to four hundred pounds of each per ton. Both substances are apparently added to serve as absorbers of moisture and ammonia, for which the calcined gypsum in particular is well adapted. Taking every thing into consid-

eration, the above sample may be accepted as a fair specimen of its kind, — "a *Humid Poudrette.*"

The name "poudrette" has been given to an important class of fertilizers, which consist, in a more or less controlling degree, of the contents of the necessaries. The articles which are offered by that name for sale differ, quite frequently, widely from each other, in regard to their chemical composition and their physical condition, and, consequently, their agricultural value, — a circumstance which accounts, to some extent at least, for the objections here and there raised against their efficiency, and their great value as an inexhaustless home-resource of plant-food. The well-recognized differences of *genuine poudrettes* are due chiefly to the following causes: *First*, the nature, the kind, and the peculiar conditions of the human excretions turned to account for their manufacture; namely, whether the liquid or the solid portion, or both, — entire or in part, in the fresh or the fermented state, — are applied; *Second*, the particular course pursued in their manufacture; whether the human excretions are worked into fertilizers with or without any foreign admixtures. The first-named conditions are quite frequently in a considerable degree beyond the control of the manufacturer of poudrette. There are sometimes four different kinds of poudrette offered for sale: —

I. *Blood or Meat Poudrettes*, which are manufactured from the solid portion of the human excretions, with the addition of blood and refuse meat from the slaughter-house, or the carcasses of dead animals. They are usually sold in a dry and pulverized state.

II. *Simple Poudrettes*, which consist of the dried, pulverized, solid human excretions.

III. *Humid Poudrettes.* These consist usually of the entire contents of the vaults, which, after being deodorized, are left in large tanks for evaporation by mere exposure, or receive additions of gypsum, &c., as absorbers of moisture.

IV. *Compost Poudrettes.* The following course is frequently pursued in their manufacture: the sweepings of the streets, ashes, refuse lime from gas-houses, and various other suitable refuse materials of factories, &c., are screened, to remove stones and other worthless materials. The screened mass is subsequently filled in alternate layers with deodorized

night-soil, in large tanks containing water-tight floors. These tanks are frequently large enough to store five hundred tons at one time. After the material has been left for from four to five months for a thorough disintegration, it is cut through from the surface to the floor, and thereby thoroughly mixed. The fertilizers No. III. and No. IV. are, for economical reasons, best adapted for consumption in the vicinity of the manufacturing establishment, whilst No. I. and No. II., on account of their higher value, may enter with good success more distant markets. There is scarcely any other class of commercial fertilizers which is apt to suffer as readily a depreciation in value from careless management of its raw material and its mode of manufacture, as the poudrettes. For this reason, they ought to be sold by analysis; at least with reference to the amount of ammonia, phosphoric acid, and potassa. A detailed statement of these substances gives a somewhat more definite idea regarding the nature of the excretions which served in their manufacture. It needs no particular argument to show the great value of the human excretions in the agricultural industry, as long as those of our domesticated animals are considered most efficient for the manuring of our farm-lands.

The food of men, as a general rule, is much richer in the most valuable elements for plant-growth than that of our farm live-stock: the same relations are true, for obvious reasons, with regard to the excretions of both. To establish that claim among our farmers requires the manufacture of standard articles of definite chemical and physical properties. It is a fact worthy of notice, that, in the most densely populated countries, the superior efficiency of the human excretions for manurial purposes has been most decidedly recognized. Belgium, like China and Japan, is largely indebted for its high state of cultivation to the extensive use of night-soil as a fertilizer. Prejudice against the more general use of the latter for the reproduction of our garden and farm crops contributes largely to the indifference which still prevails among many agriculturists regarding the magnitude of the pecuniary interests involved in the question of securing the human excretion in the most advantageous form for agricultural purposes. The same indifferent management which characterizes quite frequently the treatment of the

barn-manure causes usually a most serious depreciation of the contents of the vaults. The wasteful practice adopted in our large cities with regard to the disposition of the human excretion is not unfrequently the outgrowth of considerations which have largely lost their importance in consequence of the accumulated experience elsewhere. An intelligent solution of the sewage question in our large cities touches the pecuniary interest of every farmer. However intricate the various considerations which deserve careful attention may render the problem, the sewage question cannot be considered satisfactorily settled without a due recognition of the agricultural interests of the country.

C. A. GOESSMANN,
State Inspector of Fertilizers.

AMHERST, MASS., Feb. 2, 1878.

APPENDIX.

COMPOSITION OF SOME COMPOUNDS IN FERTILIZERS.

One hundred parts of —

Nitric acid contain 26 parts of nitrogen.

Ammonia contain 82.35 parts of nitrogen.

Pure nitrate of potassa (saltpetre) contain 53.4 parts of nitric acid and 46.6 parts of potassium oxide.

Pure nitrate of soda (Chili saltpetre) contain 63.25 parts of nitric acid.

Chloride of potassium contain 52.4 parts of potassium, 63.1 parts of potassium oxide, and 47.6 parts of chlorine.

Pure sulphate of potassa contain 54.9 parts of potassium oxide and 46 parts of sulphuric acid.

Bone phosphate (tricalcic phosphate) contain 46 parts of phosphoric acid and 54 parts of calcium oxide (lime).

Calcined gypsum contain 41 parts of calcium oxide (lime) and 59 parts of sulphuric acid.

Uncalcined pure gypsum contain 32.5 parts of calcium oxide (lime), 46.5 parts of sulphuric acid, and 21 parts of water.

Carbonate of lime contain 56 parts of calcium oxide (lime) and 44 parts of carbonic acid.

Sulphate of magnesia (free of water) contain 33.3 per cent of magnesium oxide (magnesia) and 66.6 per cent of sulphuric acid.

G.

The Report was accepted.

Mr. Merrill, for the Committee appointed to report upon the assignment of delegates, submitted the following: —

Essex	W. S. Clark.
Middlesex	Alexander Macy, Jun.
Middlesex, North	Henry C. Comins.
Middlesex, South	S. B. Phinney.
Worcester	E. T. Lewis.
Worcester, West	Otis J. Davenport.
Worcester, North	Hebron Vincent.
Worcester, North-west	John A. Goodwin.
Worcester, South	A. A. Smith.
Worcester, South-east	John A. Hawes.
Hampshire, Franklin, and Hampden	A. P. Slade.
Hampshire	Benjamin P. Ware.
Highland	William A. Warner.
Hampden	Thomas J. Damon.
Hampden, East	John F. Brown.
Union	Henry S. Russell.
Franklin	Paul A. Chadbourne.
Deerfield Valley	John Lane.
Berkshire	Edmund Hersey.
Hoosac Valley	George M. Baker.
Housatonic	Nathaniel Upham.
Norfolk	Abiel K. Abbott.
Hingham	O. B. Hadwen.
Bristol	William E. Johnson.
Bristol Central	F. C. Knox.
Plymouth	John E. Merrill.
Marshfield	Charles A. Goessmann.
Barnstable	J. N. Bagg.
Nantucket	Daniel B. Fenn.
Martha's Vineyard	Milo J. Smith.

John E. Merrill,
H. C. Comins,
Edmund Hersey,
Committee.

The Report was accepted, and the assignment made accordingly.

The committee to nominate two members of the Examining Committee of the Agricultural College submitted the names of John F. Brown and Benjamin P. Ware. The nomination was confirmed.

The committee appointed to consider and report upon the time and place of holding the country meeting of the Board

recommended that it be held at Northampton; Mr. Hersey submitting a minority report recommending the Board to accept the cordial invitation of the Hingham Agricultural Society to hold the meeting at Hingham.

After some discussion the opinion that the south-eastern portion of the State was entitled to the preference, the Board having visited that section but once, seemed to prevail; and it was voted to meet at Hingham Dec. 3, 4, and 5. Messrs. Hersey, Baker, Lane, and the Secretary were constituted a committee of arrangements.

Voted, That the Report of the Committee on Essays be referred to the Committee on Printing.

Mr. Hadwen, from the Committee of Arrangements for the Waltham meeting, submitted the following

REPORT ON THE EXHIBITION AT WALTHAM.

The State Board of Agriculture met at Waltham on the 4th, 5th, and 6th of December last; and, in connection with that meeting, there was an exhibition of fruit, flowers, vegetables, and grains. The exhibition was not as large or extensive as it should have been. Middlesex County made up almost the entire show: the exceptions were a few articles from the county of Worcester. But the floral display was magnificent; and thanks are due to Mr. Warren of Waltham, Capt. J. B. Moore of Concord, Mrs. Wood of Newton, and Mrs. Gill of Medford, for their generous contributions to this department. Mr. Royal Bemis of Waltham exhibited an orange-tree bearing on its limbs forty samples of its bright, golden, luscious fruit.

Of corn there were several samples; of rye, one; of wheat, one, and good enough to take a prize at any State fair; of potatoes, three; carrots, one; beets, one; squashes, four; celery, one; pears, seven; grapes, seven.

With very little exertion on the part of the farmers of the State, this feature of the country meetings can be made not only attractive, but a valuable source of information to all. I suggest that each exhibitor state in as clear and concise

terms as possible his manner of cultivating the articles he exhibits.

An American turban squash was shown at Waltham: it was an excellent sample of a crop of ten tons. The exhibitor very clearly and intelligently described to me his method of cultivation: would not that statement be of value to the farmers of the State?

To show the value of such statements, allow me to call your attention to the fact, that, in 1873, Dr. Fisher presented at the annual country meeting his plan of growing grapes; whether the best plan or not, I will not decide: but at Waltham he produced, as the result of that system, several plates of as nearly perfect grapes as are to be seen. The clusters were heavy, and the fruit large and uniform in size, of velvety-purple color, and of excellent flavor, proving, so far as possible, the success of his method as it was presented to the Board.

STEPHEN SHEPLEY.

The Report was accepted.

Mr. BAGG, from the Committee on Farmers' Institutes, submitted the following paper, prepared by Mr. HEBRON VINCENT, on —

FARMERS' INSTITUTES.

Although not one of the Committee on the subject of Farmers' Institutes, I desire to present some facts and views upon the subject.

It will be recollected by the secretary (and perhaps by some of the older members), that I had the honor, while not yet a member of the Board, of having a hearing upon the subject, through a communication addressed to him, suggesting somewhat in detail the outlines of a plan for the holding of such institutes, with the various societies represented here. That communication was laid before the Board at its Annual Meeting in 1870, and, after some discussion and other action, was referred to a committee to consider, and to report to the Board at its next Annual Meeting. Accordingly, that committee reported a resolution, which was adopted, as follows: "That the various agricultural societies of

the Commonwealth be requested to organize an annual meeting for lectures and discussions, at such time and place as may be convenient to each society; these meetings to be denominated "The Farmers' Institutes of Massachusetts."

Having had some knowledge of the Teachers' Institutes in the State, held under the superintendence of the secretaries of the State Board of Education (which Board, this, in its incipiency in 1851, was designed to resemble somewhat), I had been considering, at times, for some two or more years, the propriety of holding meetings on a similar plan, under the name of "Agricultural Institutes," with the secretary of this Board at their head. I had conversed with quite a number of gentlemen, in whose opinions on such a subject I had confidence, and from whom were received words of approval; and our excellent secretary very kindly consented, that if I would write out my views, and forward them to him, he would lay them before the Board at the Annual Meeting; which he did.

My proposition, in substance, was to hold meetings, at proper intervals, in some place within the limits of each agricultural society. As there are about thirty such societies represented in this Board, ten such meetings each year would give one to each society once in three years. It was not proposed to hold them as many days, nor to have any thing like the number of lecturers, as at the Teachers' Institutes. Two or three days were deemed sufficient, with the secretary, or some one by him selected to arrange and preside, and one or two other lecturers. It was proposed to have very free discussions on the topics of the lectures, and on subjects previously assigned, with speakers named. All the farmers within the society's limits were to be reckoned as members, and the public generally to be invited. Music, when practicable, was to enliven the exercises. While it was conceded that the Agricultural College was doing a great and an important work, and should be amply sustained, it could not at present, perhaps never, supply the help to the masses of the farmers in the State that would be secured by such a system of meetings, because the latter would bring important practical instruction down to their very hearthstones. The only objection of any weight seemed to be the expense; but this, it was evident, must be compara-

tively small, and fully justified by the good to be accomplished.

The vote of the Board upon the subject, while it was a step in the right direction, did not make the holding of such meetings obligatory; and, while I am not advised as to the extent to which the recommendation has been followed, I infer from what I have heard, that, where any attempt has been made, the meetings have been of rather short duration, and with few, if any, lectures.

In conversation with the secretary, I think within a year or two last past, upon the subject of making these gatherings more systematic and effective, according to the plan originally suggested, he named a serious obstacle, which was the lack of suitable men in sufficient numbers, who could give up their time to the work without compensation. Scientific men could not work for nothing, and we have no fund to pay with. Now, with all due deference to one so well qualified to judge, it seems to me, that, with the time he could devote to such a department of useful labor, we have a pretty strong force, consisting of many members and ex-members of this Board, who are eminently qualified to render just the service needed. In addition to these, there are the president and professors of the Agricultural College, who must be ever fresh for such a duty, and that without increasing the number of the latter, as recommended quite recently in an address by ex-Gov. Boutwell, to supply the specific work which he contemplated. Then there are men of mark in other colleges of the State, and in other callings, — clergymen, doctors, lawyers, and many of the men in public offices.

As to the expense, all local expenses would, of course, be met by the societies; and as to pay for lectures, — as the number would in each case be small, and the charges, doubtless, moderate, — the amount could not be such as to trench upon any other interest, certainly not on that of the Agricultural College; the fear of which, I have supposed, may have raised an objection in the minds of some. On the other hand, I apprehend all these interests would tend to strengthen each other.

In conclusion: while the Country Meeting of the Board does a good work, and the Farmers' Clubs, where meetings of the same are held, are doubtless useful, neither the former

(which occurs but once a year, changed around in different parts of the State), nor the latter, nor both together, can accomplish the work so desirable. Moreover, such an example would be a credit to the State.

A long discussion followed, when, on motion of Mr. Moore, it was,

Voted, That the agricultural societies receiving the bounty of the Commonwealth be requested to arrange and hold one or more Farmers' Institutes each year within their limits; and that they be informed that the Board will render all the assistance in its power to make such institutes instructive and useful to the public.

The several reports, essays, and papers that had been presented and discussed during the session, were then read a second time by their titles, and adopted.

Voted, That all unfinished business be referred to the Committee on Printing, with full power.

The Board then adjourned.

The reports of delegates appointed to visit and inspect the exhibitions of the various agricultural societies give sufficient evidence of continued life, vitality, and growth; and no one can consider the immense numbers of people who annually flock to these festivals, without coming to the conclusion that they are doing good, and are worthy of the continued patronage of the Commonwealth. Here and there, no doubt, a critical eye will discover points in which some societies fall far short of the standard which ought to be expected of them, and deficiencies which might and ought to be remedied; but, in many of these cases, such defects will be found to spring from mistakes in judgment, which will gradually be corrected. Abuses often grow up in the best managed institutions, and sometimes continue to increase till they attract the eye of even the casual observer; but, when they reach such magnitude, they invite the application of radical remedies.

The suggestions thrown out in the essay upon the management of societies, to be found on a preceding page of this Report, are worthy of careful consideration by the officers of all such institutions. They point out the changes that are required to increase the efficiency and the usefulness of many agricultural societies, and furnish very timely hints for those who honestly desire to set up and maintain a higher standard of excellence. However much our societies have done to advance the cause of agricultural improvement and prosperity (and it is by no means small in amount), it must be admitted that they have fallen far short of their possibilities. No society would claim that it could not do more to stimulate the development of the agricultural resources within its limits. How this may be done, and how the societies may correct the faults, of which there is more or less just complaint, has already been pointed out.

The societies can, without doubt, do more than they are doing, to stimulate and encourage more accurate, careful, and scientific experiments, and insist upon a more minute and elaborate statement of them for publication. In this way they could do much to meet the wants of the farming community till we can have a system of experiment stations which shall be devoted exclusively to this object.

I have elsewhere urged the importance of establishing an experiment station on the farm of the Agricultural College, where there exist abundant facilities for investigation, except so far as the want of money to meet the expense goes. Experiment stations are recognized as a necessity, and sustained as such, by the most enlightened governments in the world. A very large part of the progress and development of German agriculture, during the last quarter of a century, is due directly to the liberal support of such stations. They form a conspicuous feature of the comprehensive system adopted by the government for the development of the agricultural resources of the empire. The results have abundantly justified their organization, and placed the farming of Europe in the front rank among the industries of all civilized nations.

In 1851, more than a quarter of a century ago, the first experiment station was founded at Moeckern, in Saxony; and it soon proved to be so useful, and secured the confidence of the common people to such an extent, that the idea soon spread

through Germany, and into other countries, till, in 1868, there were no less than twenty-eight stations in full and successful operation ; and now the number is increased to sixty-two, sustained largely by governments, but with the co-operation of individuals and agricultural societies. They have proved themselves of immense service, and are rapidly increasing in number and efficiency ; while, at the same time, the agricultural colleges and schools are more numerous, and better sustained, than they are in this country.

But an experiment station costs money. The trustees of the Agricultural College have not the means to organize it without the aid of the Legislature. The French Government, always studious of the interests of the people and its own financial strength, sent a thoroughly competent man, M. Grandeau, to visit and study the experiment stations of Germany ; and he reported to the French minister of agriculture, that a useful station could be started for six thousand dollars, and that it would cost three thousand dollars a year to maintain it. The expenses of the Prussian stations vary from eight hundred to four thousand dollars a year, according to the completeness with which they are organized and equipped, and the number of scientific men employed. They would cost more in this country; but the cost will depend very much upon the amount and kind of work required of them.

The work of an experiment station requires not only land sufficient for field-operations, but especially chemical and physiological laboratories. All these appliances are at hand at the Massachusetts Agricultural College ; and it would involve little additional outlay on the part of the State to organize a station on the most thorough basis. The quantity of land required for experimental purposes is not large. A portion of the college farm could be set apart for these objects without material detriment to the interests of the institution, while the laboratories would furnish immediate facilities for scientific investigation.

Every farmer recognizes the fact, that most field experiments, to be of any great general and permanent value, require to be carried on through a series of years, and that they require great expense. But that they pay, and pay abundantly, for the outlay, is now universally recognized by farmers throughout Germany, who contribute largely and cheer-

fully for their support, in the form of small fees for analyses. It may be stated, also, that the work of the German stations has become thoroughly systematized by the division of labor, each one taking some special line of investigation, and leaving other specialties to other stations. The station mentioned as having been first founded at Moeckern, for instance, now confines itself chiefly to studies and experiments in the nutrition of animals; and some of the stables on the farm are set apart for the cattle required. Other stations are confined specially to experiments in fertilizers, and the nutrition of plants, to animal and vegetable chemistry, and physiology. Agricultural research, the discovery of new truth, and the test of older theories, is the work of them all, to be sure; but the field is so vast, that experience has dictated the economy of division of labor. And so it may be argued, that we need numerous stations in various parts of the Commonwealth; and it is true. But we shall never have a system of such invaluable institutions, unless we make a beginning in the establishment of one; and true economy would dictate its location in connection with the Agricultural College, where the requisite scientific appliances are already at hand.

In the mean time, the societies can do more than they do now in this direction, and it is not unreasonable in the public to expect and demand it of them. We cannot shut our eyes to the fact that we are to look more and more to the accurate investigations of science as the source from which any steps of real progress are to come. We shall not always grope along blindly in the dark; and science alone can throw light upon the variety of questions that constantly meet us in our daily practice. This fact is certainly to be recognized in the future to a much greater extent than it has ever been in the past.

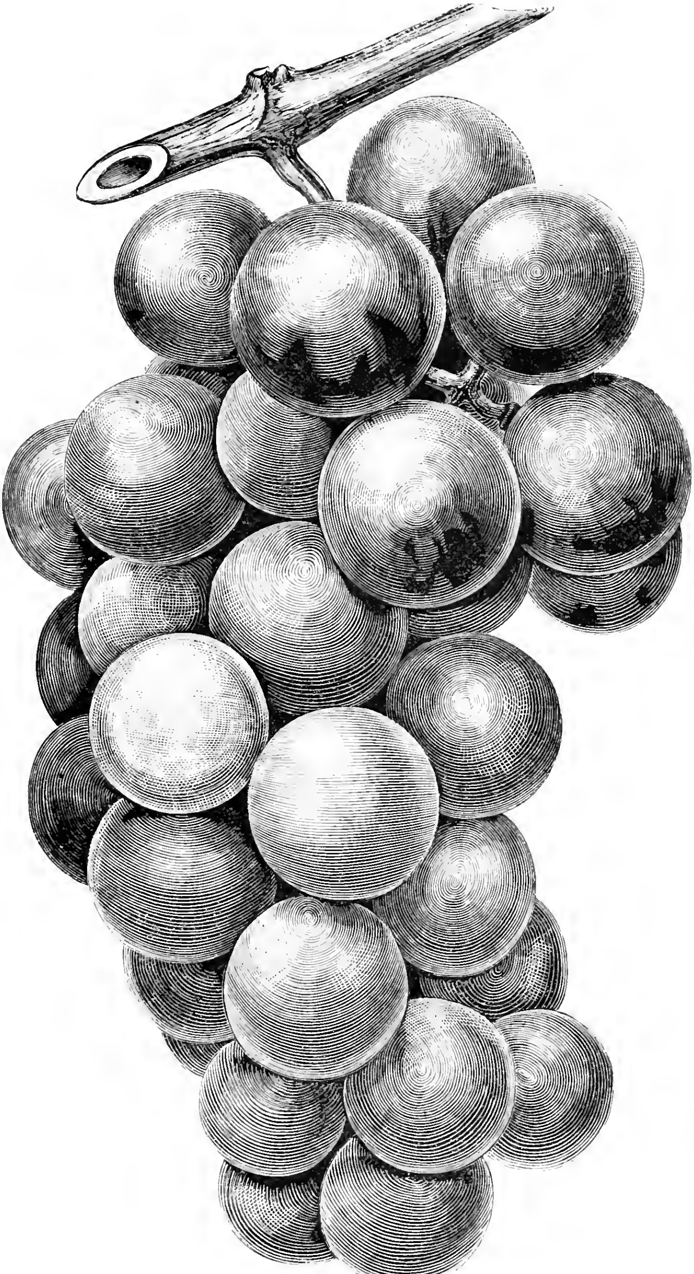
It is to be hoped, also, that the suggestion to hold one or more Farmers' Institutes within the limits of each society will commend itself to the favorable consideration of the officers of all the societies in the State. Associated efforts, in the way of public meetings for lectures and discussions, stimulate individual enterprise, diffuse valuable information, and excite emulation in the direction of improvement. Very much of the progress already made is due to associated effort; and there never was a time in the history of progress,

when people were so ready to receive and consider the facts which lie at the foundation of success, or so ready to appreciate the results of scientific investigation.

If the officers of every society would enter heartily and earnestly upon the work of improvement, with a feeling that they have a mission to perform, and that a personal responsibility rests upon them to extend the beneficent influence of their organization all over their territory, the time would soon come when they would see the results of their labors, not only in a growing enthusiasm for agricultural pursuits, but in increased production, enterprise, and prosperity.

CHARLES L. FLINT,
Secretary of the State Board of Agriculture.

BOSTON, January, 1878.



MOORE'S EARLY SEEDLING. Copy from a Photograph. See p. 308

APPENDIX.

REPORTS OF DELEGATES

APPOINTED TO VISIT THE

AGRICULTURAL EXHIBITIONS.

ESSEX.

The Fifty-seventh Annual Fair and Exhibition of the Essex County Agricultural Society was held at the city of Lawrence on Tuesday and Wednesday, Sept. 25 and 26, 1877.

The fine specimens of horses, cattle, swine, sheep, and poultry, were well arranged on the grounds, displaying some excellent blood stock, constituting the essential element in each department for improvement in breeding and keeping. At noon there was an imposing cavalcade, and an interesting procession of representative industries from the neighboring towns, comprising town teams and elegant turnouts, interspersed with barges, with fine bands from different towns, discoursing enlivening music; the whole preceded by the marshals of the day, mounted on gayly caparisoned steeds, and the officers of the society in carriages. It was a very popular feature of the day's entertainment, and imparted a spirit of enthusiasm to the occasion.

In the afternoon there was a trial of draught-teams, of horses and oxen, required to draw up a long hill, showing skilful training and power. At the close of the drawing a mammoth yoke of imported Dutch bulls, weighing respectively two thousand and twenty-one hundred and fifty pounds each were tested with the usual weight of two tons of earth in the wagon. By request thirty-seven men mounted the load. No sensible diminution was perceived in the pace and ease with which they walked up the steep hill. On being stopped, they started again with as little effort as they would have done on a smooth plain without any load. The estimated weight of the load was seven tons.

This was a good example of the practice of working bulls as

oxen are worked. They were in a thriving condition, and well adapted for every kind of service.

On Wednesday there was a grand ploughing-match, at the ground, with thirteen competitors and a well arranged order of exercises. The soil was laid over in a skilful manner, to the satisfaction of competent judges and a large and enthusiastic attendance of spectators. The exhibition was held in the City Hall, and was of the highest order. The display of fruits, vegetables, flowers, and other plants, was worthy of the fullest commendation. Contributions of the mechanic arts and manufactures were superior to any other exhibitions at our county fairs. The manufactured fabrics were from the renowned mills of the city, and were unsurpassed for the richness and beauty of their texture and the magnificence of their display, being in elaborately carved cases, resembling the centennial exhibition. The total cash value of these fabrics was estimated at a hundred and fifty thousand dollars.

The address was delivered by Rev. O. S. Butler of Georgetown. His subject, "The Characteristics of the Successful Farmer," was ably and happily treated, showing that the want of success arose from the same general cause which produced similar results in all the pursuits of life; viz., the want of adaptability, — the wrong man in the wrong place. It was an eloquent and practical discourse.

The annual dinner, in a large tent on the Common, where were seated over seven hundred, was served up in good taste. At the close, the president of the society, Mr. Benjamin P. Ware, extended his congratulations on the favorable auspices under which this exhibition had been held, and the character and variety of farm products, fruits, and the unsurpassed manufactured productions, all of which had proved sufficient to attract attention without the introduction of horse-trots and base-ball matches. Excellent addresses followed from Dr. William Coggswell of Bradford, councillor from Essex; ex-President Joseph Howe of Methuen; Hon. James J. H. Gregory of Marblehead; and Dr. George B. Loring, M.C. His Excellency Gov. Alexander H. Rice addressed the meeting in an eloquent and practical speech, congratulating the society on the enterprise of the farmers of the old Bay State, and saying that all the pursuits of our nation were bound in unison with agriculture, and that God had given us the means to make us the greatest nation since the dawning of creation. His remarks were received with rapturous applause.

This society has a large revenue from means invested, and is free from debt. Great credit is due to the president and other

executive officers for the management of the fair, and the demonstration of this fact, — that a successful fair, instructive, pleasing, and elevating in its tone, can be held without the aid of 2.40s and their concomitant allies.

Your delegate is under obligations to the president, Benjamin P. Ware, Esq., and his associates of the society, for the pleasant memories, which will long remain, of the courteous and cordial entertainment which he received from them; and he takes pleasure in recommending this society to the favorable notice of the State Board.

ALEXANDER MACY, Jun.

MIDDLESEX NORTH.

On my way to Lowell, I stopped over one train in Springfield to see the first day's exhibit of the Hampden Society; and, visiting the show of the Middlesex North on the following day, the different methods of the two societies were contrasted in my mind. Each has its location in a thrifty and enterprising city, surrounded by towns largely engaged in agriculture.

The Hampden Society holds its exhibits of live-stock, save poultry, on Hampden Park, while the usual hall exhibition is shown in the City Hall of Springfield. My only wonder was, that so few people were present to see the really excellent display in all departments of the show; and the question was suggested, whether this division of the exhibition on Hampden Park and in the City Hall might not account, in part, for the small attendance.

The Middlesex North, like most of the societies in the State, has concentrated all its exhibition in one place, having spacious grounds and a large hall within the same; so that one entrance-fee admits to the whole show.

Two things are essential to a successful exhibition, — a large and attractive display of real, substantial worth, and the presence of a large crowd to see the same.

Hence officers of agricultural societies, in laboring for a successful exhibition, must work with reference to these two essentials; and especially, since most societies depend quite largely upon admission-fees for means to meet current expenses, and continue future operations, it becomes a matter of the first importance that the management of the affairs of the society and of the exhibition be such as to secure a large attendance.

This fair of the Middlesex North, judged by the attendance, must be pronounced a success.

It was evident that the officers, while taking proper care of the character of the exhibition, had skilfully adapted means to ends, so as to secure the large attendance, and thus secure financial success.

This society is to be congratulated in having live men at its head, who know how to plan, and have the ability to execute their plans, for the prosperity of the society.

I saw the various exhibits of stock, not large in number, nor specially noteworthy in quality.

A herd of Brittany cattle was the centre of attraction in the stock line. Feats of running, both of men and horses, aroused the usual interest and enthusiasm. The large hall — amply filled with the choice products of farm and garden, mills, households, and shops — was also filled with eager, interested spectators.

I am not able to particularize the special entries worthy of mention; and there is the less need of this, since the secretary of this Board was himself present, with his Excellency Gov. Rice, and the speaker and clerk of the present House, who constituted no small part of the exhibition itself.

METCALF J. SMITH.

MIDDLESEX SOUTH.

The Twenty-fourth Annual Exhibition of the Middlesex South Agricultural Society, at South Framingham, was held on Sept. 18 and 19. I arrived on the grounds on the morning of the first day of the fair. I found the society had beautiful grounds of about thirty acres, and had built upon them a long string of sheds for cattle and horses, with a goodly number of pens for sheep and swine; all being convenient for use, and in good repair. During the day there was a large number of cattle of the different breeds brought in for exhibition; and several swine were in the pens provided for them. The pens were well arranged, with good accommodations for loading and unloading the swine.

Among the exhibitors was C. H. Tilton, with his fine Dutch cattle. E. Burnett, E. F. Bowditch, and Moses Ellis had several pens filled with nice cows and heifers of the Jersey breed. E. F. Bowditch had some very fine Guernsey heifers, that looked very promising for the dairy. John Johnson, Sturtevant Brothers, and W. S. Phelps had several head of cattle on exhibition, of the Ayrshire breed, that were very good. There were several pairs of working-oxen on the grounds. The show of swine was large:

most of them showed good breeding and good feeding. Several coops of poultry on exhibition attracted considerable attention.

The exhibition of fruits, flowers, and vegetables in the hall was not as large as in former years; but there were some as nice pears, peaches, and tomatoes as could be seen anywhere. The baskets of potatoes that were exhibited showed great growth and superior quality; while several specimens of seed-corn were very creditable to the owners.

The ploughing and spading match on the second day was managed in a workmanlike manner by several competitors. The great attraction of the day was the exhibition of trained steers by Walter A. Gaskell of Mendon, sixteen years old; Charles Taft of Uxbridge, eighteen years old; Frank H. Wood, seventeen years old; and Eugene Batse of Mendon. The steers were hitched to the plough, and showed that they could do that kind of work well. They were hitched to an ox-cart, and showed that they were perfectly familiar in handling the cart, both by drawing a load, and backing the cart. Some of the steers spoken of were only one year old. They also performed many things that it would seem impossible for cattle to do,—such as getting on a bench two feet high, one foot wide, and three feet long, and, while standing there, putting their forward feet on an elevation about fifteen inches higher. They were driven to jump through a hoop, and, at the same time, over a pole that was about two feet from the ground. They were taught to walk on their knees, to lie down and permit their driver to turn them over. One steer laid down while the other would jump over him. They were put on a plank in such a way that they would see-saw. Many other tricks were performed by these steers. This exhibition of trained steers attracted the attention of a large number of people who seemed to say they never saw such feats performed by steers before. The exhibition of horses in the several divisions, both for breeding and farm-use, was very creditable to the owners. There were a number of carriage-horses and roadsters, besides many fine young horses, which were worthy of notice.

At one o'clock on the second day, the officers and members of the society, with their families, assembled in the dining-hall, where dinner was furnished, which all seemed to enjoy for about half an hour. After dinner, Dr. George B. Loring delivered an interesting address, which occupied the time till the hour for the horse-trot, which was contested by a number of competitors for the purses amounting to six hundred dollars.

The officers of this society are working-men, and have looked after the interest of the society in all its departments. Every thing was in its place; and the fair has been one of the best they ever had.

I would not fail to acknowledge the cordial welcome and generous hospitality extended to me by the president, David Nevins, jun., and lady. And there I witnessed some good farming in raising a field of twenty acres of corn, estimated to yield one hundred bushels of ears to the acre, with no other fertilizer than the Stockbridge Formula.

JOHN E. MERRILL.

WORCESTER.

The Worcester Agricultural Society, one of the largest and most honored in the Commonwealth, held its last Annual Fair on the days prescribed by the Board; and your delegate was there an impartial and critical observer. A good exhibition was expected from such a prosperous city of fifty thousand inhabitants, backed up as it is by a *coterie* of fifty-six such industrial towns. Considering the fact that this venerable society has five grown-up, independent daughters settled about her, each with flourishing families of their own, it seemed to us a wonder that twenty-six towns could be found, who would show their allegiance by making contributions to this parent-society.

But such was the case; and, so far as we could judge, the utmost cordiality prevailed. One of the noticeable features of the exhibition was the good old-fashioned ploughing-match, and the interest it awakened. It very properly opened the exercises; and there were twenty-two manly competitors, two-thirds of them driving ox-teams. The number and skill of the ploughmen only perplexed the judges, who in such cases are always deserving of pity. The display of cattle was select, varied, and creditable. The hardy Swiss, attracting attention by the constant tinkle of their soft-toned bells, the delicate Jerseys, the plump Ayrshires, the bright Devons, the portly and sluggish Shorthorns, were all ranged in good order for inspection and contrast. Besides these, there were grades of various sorts, and the choicest of the common herd, fat oxen and hardy steers, all betokening the primary and intermediate steps of bovine greatness.

Our esteemed friend Hadwen was, of course, there, with a dozen and a half of his favorite Jerseys, the result of nearly as many years of patient devotion to his chosen calling; but he had little, if any, competition. That he richly deserved to stand at the head, and win all the premiums he could, we never questioned; but when we learned, that, within the city limits, there were two other large and valuable herds, and that there were nearly three hundred Jer-

seys in the immediate vicinity, we felt sorry for the public that there was so little competition. It was like a race with one entry; and, though our friend was not at fault, the honors were too easily won. The same was measurably true of the Swiss exhibition of Mr. Aldrich, the Shorthorns of Mr. Slater, and the Devons of Mr. Dodge. Among the Ayrshires there was more competition. We observed that twenty yoke of cattle from Sutton took both the town team premiums, because the offer of the society simply spoke of the best ten pairs. There were ten pairs of fancy-trained steers, all remarkable for their learning, — some of them drilled by minors, and some of them that travel for a living, and make a business of drawing premiums at other fairs. We think it a question how far this should be carried.

The other departments of the exhibition were also good, and very creditable. About a hundred swine of all ages were there, and well fed, regardless of the decline in pork. We noticed some novelties in the line of agricultural machinery, and a single exhibitor who had twenty different plough-patterns and fifty varieties of other tools.

The horse-exhibition, comprising a goodly array of colts and carriage-horses, and some fast steppers, was held on the second day.

We were particularly pleased with the extensive dinner arrangements and the social festivities afterwards, which characterized both days. Ex-Gov. Chamberlain of South Carolina, a native of Brookfield, was the chief speaker the last day; and I see a brief abstract of his address in the society's Annual Report. Take it all in all, the exhibition was a good one; and its tendency appeared to be that which we all have at heart, — the promotion of agriculture in the heart of the Commonwealth. Notwithstanding the society's large debt, they offered $1,600 in premiums, and paid out $1,359. To the president of the society, who is also mayor of the city, and to Mr. Hadwen, your delegate is under obligations of gratitude for the many courtesies received during his visit.

J. N. Bagg.

WORCESTER WEST.

This society held its Annual Fair at Barre on Sept. 27 and 28. The first day opened fine; and the attendance was unusually large. At the ploughing-match sixteen teams, eight each of horses and oxen, competed for the prize; and they did good work. The

show of neat-stock was the best ever exhibited at that place, the number of animals entered being four hundred and fifty-five. Of this number, one hundred and sixty-two were cows giving milk. About one-eighth of the whole number consisted of pure breeds, showing that the farmers of that section are looking to their best interest by improving their farm-stock.

The town of Petersham exhibited a string of thirty pairs of good oxen. The show of horses, sheep, swine, and poultry, was unusually good; and the display of fruits and vegetables in the hall was fully up to other years, while the exhibition of butter and cheese was excellent. The Barre Central Cheese Company exhibited a cheese weighing 1,015 pounds, which took 9,272 pounds of milk. There was also a good display of mechanical arts and agricultural implements.

The interest the ladies take in the affairs of this society was manifested by the beautiful floral display, and its tasteful arrangement.

On the second day the weather was stormy and unpleasant, which greatly diminished the receipts. We judge, however, from examining the society's report, that it stands financially much better than some of the societies in the State.

MILO J. SMITH.

WORCESTER NORTH-WEST.

The Eleventh Annual Exhibition of the Worcester North-west Agricultural and Mechanical Society occurred at Athol, Oct. 2, 3, and 4. There were many things to admire, and few to criticise. I saw, by the name of this young and prosperous society, that every class of industry was invited to participate in its exhibitions. This was manifest in the articles on exhibition in the hall, and the stock so systematically arranged about the beautiful grounds, as well as in the immense crowd of people who had come from far and near to enjoy this annual festival.

The morning of the first day was occupied in making the necessary *entrées* of stock and articles for the exhibition. Then came the ploughing-match, one of the most beautiful and profitable features of an agricultural fair: I am sorry to see it is abandoned by so many of the societies of the State. In this match there were several horse-teams and ox-teams which competed for the premiums; and, notwithstanding the roughness of the ground, all plainly showed that they were used to the business, — both ploughmen and teams.

The exhibition of working-oxen and steers was good. A pair of workers owned by Mr. Harvey Goddard of Orange were particularly admired by the cattle men for their many fine points; and yet the honorable committee awarded this beautiful pair the third premium; thus showing how men differ in their judgment. There were also on exhibition many fine pairs of fat cattle: one pair, entered by A. E. Johnson of Barre, were beauties, weighing four thousand pounds, and many others were worthy of mention. But I will not particularize; suffice it to say there were enough to show conclusively that the admiration for the ox had not entirely disappeared. I was astonished when I saw the thirty-five yoke of splendid-looking cattle of the Shorthorn and Devon breeds, from the town of Phillipston, and also the sixty-five yoke of equally good cattle from Petersham, constituting the two entries of town teams. It was a most beautiful sight; and I said to myself, "If this is degeneracy, what must have been the original idea of a cattle show?" And yet we hear the cry from all parts of the State, through the press, that cattle shows have become "first-class humbugs." Now, let us see how much of a farce this cattle show was. There were in all three hundred and forty-seven head of cattle upon exhibition, consisting of bulls, milch-cows, heifers, calves, working-oxen, steers, and fat cattle. The show of sheep was small in point of numbers, but of an excellent quality.

The show of swine was unpleasant to behold, not on account of the inferiority of the animals exhibited, but rather from the manner in which they were exhibited. We noticed some very fine specimens of the Essex bred, exhibited by Mr. Joseph S. Hinkly of Barre; also of the Poland China, bred by Mr. Henry S. Minor of Phillipston. Messrs. William A. Childs and Luther Crawford of New Braintree exhibited some very fine Berkshires. Mr. George W. Drury of Athol had two very fat hogs upon exhibition, of the Chester White breed; and Mr. E. A. Marsh completed the show of swine with a beautiful litter of pigs. All these fine animals were confined in wagons, with but a slight (if any) protection from the rays of the sun, when the thermometer stood at about seventy degrees above zero in the shade. This is one of the things connected with the show which I would criticise. The officers of the society should provide suitable pens in their grove, erected and constructed with a view to make the animals on exhibition as comfortable as possible, and then require all exhibitors to place their animals in such pens.

The show of poultry was the best I ever saw at a show not devoted entirely to the exhibition of poultry and pet stock. It would take too much time for me to give the names of the different varieties and breeds. I will make the broad statement, however, that nearly all of

the leading breeds of poultry were on exhibition. Among the many extensive exhibitors in this department we noticed the names of P. and E. Johnson of Barre (boys) ; and the success of their efforts to compete with those older in this department should stimulate other youths to enter the field. Every society should have a Youths' Department. Only $35.50 were awarded for poultry ; and it seemed to me to be a very small sum, considering the very large number of exhibits. The raising of poultry should be encouraged to the fullest extent ; and a much larger sum should be offered and awarded for such an exhibition as your delegate witnessed at this fair.

The Agricultural Horse Show was good in all its departments. Mr. B. W. Washburn of Barre exhibited a fine pair of matched carriage-horses. In the classes of Gents' Driving Horses and Family Horses there were many entries and some beautiful animals ; still, somehow or other, an " old track-horse " would compete in each of these classes, and, of course, pass under the wire " a neck ahead," and carry off the first premium, notwithstanding the instructions, " speed not to govern." The show of breeding-mares and colts would do credit to any society in the State ; but that of stallions was not what one would reasonably expect, in point of numbers. The stallion that was the most admired was Mr. S. F. Twitchell's Gold Finder. He was a show of himself. The exhibition in the hall was good ; that of fruit, remarkable, for this the off-year ; there being on exhibition three hundred and seventy-five plates of fruit, embracing apples, pears, peaches, grapes, and quinces.

There was also a fine display of vegetables and other farm products.

The collection of fancy articles was a very large one, and systematically arranged for the convenience of the judges as well as the visitors.

I was surprised not to see more agricultural implements upon exhibition. I think a mowing-machine, plough, and horse-rake completed the list.

The numerous articles on exhibition in the hall remained during two days of the fair, while the cattle, sheep, swine, poultry, and all the horses not entered for the " races," were homeward bound at the close of the first day's exhibition ; and this ended what seemed to many the agricultural part of the fair.

I certainly should be remiss in my duty, did I not mention the society's dinner as one of the pleasant and profitable attractions of the fair. The dinner was fine ; the tables filled to their fullest capacity : the speeches were practical, and participated in by many.

The second day of the fair was the Horse Day; and, as is customary, a much larger crowd of people assembled upon the grounds than on the day previous. In addition to the fact of its being the Horse Day, it was announced that the president of the society, Mr. Jerome Jones, would be in attendance, with a large number of distinguished men from Boston as invited guests. This, no doubt, attracted many that would not otherwise have come. Among the distinguished guests of the society was the Hon. W. A. Simmons, collector of the port of Boston; Hon. Stephen N. Stockwell of "The Boston Journal;" and John C. Wyman, Esq., of New York; all of whom added pleasure as well as profit to the occasion.

The third day of the fair was a Benefit Day, and everybody was expected to pay an admission-fee. The show was what one might call a "variety entertainment:" the programme was made up to suit every one of the vast multitude. There was to be base-ball playing, horse-trotting, man-running; and, last but not least, the whole affair closed with the band tournament, in which five bands competed for the prizes; Leominster Band receiving the first prize, the Fitchburg, second, and Gardner, third. Your delegate saw nothing during the fair of an unlawful character.

This society has a debt of about eight thousand dollars hanging over it; and this, no doubt, stimulates the officers and members to great exertions each year to cancel some portion of its indebtedness; and this year, I am happy to say, was not an exception to the rule, they having reduced the debt over a thousand dollars.

I trust it will be interesting to the members of this Board to know the amount of money awarded by this society in the different departments at their exhibition. The amount offered, awarded, and actually paid out, for farm improvements, was only twenty-four dollars, thus showing that the farms are either in a high state of cultivation, or little interest is manifested in this department. The amount awarded for farm stock was five hundred and twenty-five dollars, and for farm products over a hundred dollars. The amount awarded for agricultural implements was twelve dollars, — a sum far too large, considering the implements shown. The amount awarded for trotting-horses was six hundred and forty dollars, a large share of which was received as entrance-money; and $422.50 was awarded for mechanical inventions, domestic manufactures, &c., swelling the amount of money awarded to nearly eighteen hundred dollars for premiums and gratuities at this fair. This is a large amount; and the question comes to many, "Does it pay?" I answer, "Yes;" and I believe every one connected with the Worcester North-west Agricultural and

Mechanical Society will echo, "Yes." This society is doing a great work in promoting the interests of agriculture, and, while striving for that object, should receive the bounty of the State. The visit of your delegate to this fair was a very pleasant one, and he is not unmindful of the attentions given him by the officers and members of the society, and also of the gentlemanly treatment of the landlord of the Summit House, who was caterer for the society on this occasion.

A. A. Smith, *Delegate.*

WORCESTER NORTH.

I was assigned to attend the Twenty-fifth Annual Fair of the Worcester North Agricultural Society, and report on the same. The exhibition was holden this year, for one day only, on the 25th of September. It was one of the most lovely days of that beautiful month. Every thing conspired to make it a success. The officers did all in their power to make the day such. Their work was well done; and they should be congratulated that their efforts were successful and appreciated. The entrance-fee to the grounds and tickets for the dinner were reduced; and this called out more people to the fair, and called in more people to dinner, and more funds to its coffers. This reduction was a gain in the finances of the society.

The exercises of the day opened at nine o'clock, A.M., with the ploughing-match. There were nine entries, — four ox-teams and five horse-teams. Hon. E. Torrey, nearly eighty years old, held the plough of one of these teams through one round; and Deacon Shepley, a member of your Board, drove the team. The old men, the young men, and the boys, thought this a rare sight; and, as the team made its round, these "old boys" were greeted with cheers that made the welkin ring; and, as these veterans wiped the sweat from their brows, they seemed to feel that young blood was again coursing through their veins. But, when they ascertained that a gratuity was awarded them, it is said that it took the rheumatism all out of the squire's shoulder, and the old deacon forgot for the time being that he ever had a disease of his heart. After the exhibition of the ploughing-match came that of working-oxen. Here the competition was small. H. A. Wood took the first premium.

The Jersey herd of John F. Brown of Lunenburg, who takes the place of Deacon Shepley on this Board, was the largest and most marked of any on the ground. The Shakers' herd of Jerseys

and the Durham cows of Lyman Nichols gave evidence of good breeding. Many cows, thoroughbreds and native, looked like good milkers; but, on the whole, the dairy stock did not equal that shown in some sections of the State. The herds of Messrs. Whitman and Miles have for a long time been prominent in this locality; but this year they were absent. The one would yield his stock, and pass over his broad acres to another; while the other has passed over where he heeds not the lowing of his herds, nor the bleating of his flocks.

The show of sheep, swine, and fat cattle, was not a prominent feature of the occasion; but some good specimens were on the ground.

The poultry was fine, and put in high claims for excellence. Hen-dom was represented by Light Brahmas, Natives, Plymouth Rocks, Bantams, Games, and Hamburgs, each claiming that they were better fighters, better layers, better mothers, better broilers, or excelled in some department of the hennery; so that every other breed could not hold a candle for this breed even to go to roost.

The show of grapes was excellent; and the fruit premium was awarded to Dr. Jabez Fisher of Fitchburg. When the doctor enters this list as a competitor, all others may as well come down at once, as were wont the coons of Kentucky when Daniel Boone brought to bear his rifle on them. The show of pears was magnificent; but the doctor's Jewett and Fisher carried off the palm.

Many of the apples were appetizing, good to look upon; and, although they were not in such profusion as in the even years, yet we think no one could cast the first stone at Mother Eve for yielding to the desire to taste the delicious, blushing fruit, and thereby obtain a certain knowledge whether it was good or evil. The ladies did themselves credit in their exhibition of dairy products, and their flowers, natural and artificial, and also in their works of art, embroidery, and needlework. Many received notice by premiums. But time would fail me to tell of all the sellers of purple, the Lydias, the Tabithas, full of good works and alms-deeds; or even mention the coats and garments made by the Dorcases, scattered from Joppa to Thyatira through the whole district.

The dinner of the society was holden in the upper hall, provided by the ladies, and graced by their presence. Every seat was filled; and many had a standing one, or waited for a resetting of the tables. This social sit-down was the most enjoyable part of the entertainment. John B. Proctor presided; and, after the invocation of the divine blessing, all fell to with appetites like tillers of the soil, and did ample justice to the viands spread. Here

every one seemed to feel at home, and enjoy the festivities of the occasion. A good dinner, a social time, a friendly meeting around the festive board, are the best features of a cattle show, and tend to wake up and keep up a lively interest in this holiday of the yeomanry. After the inner man had been filled, the president spread the feast of reason, and set in motion the flow of soul, by calling up the mayor of the city, the member of the tenth congressional district, the delegate of the Board, State senators, representatives, and other dignitaries of the vicinity. These all extemporized their ideas, and received the plaudits of their peers, as they breathlessly hung upon the lips of these agricultural orators unfledged, fledged, and full-fledged, as they poured from the storehouse of thought their words of wisdom and experience.

Although the horse department of the show was not the all-absorbing topic of interest, as at some fairs, giving one or two days to this feature of it, yet we fear, that, with few exceptions, through the State the interest in the horse, compared with that in stock, is too prominent. Here were exhibited many fine family and driving horses; but those for speed commanded the greater interest. Horses are bred for speed instead of service; but, if the breeding was reversed, much more money would be realized by the masses than is at present. The fleet ones are few and far between; and the breeder may spend a lifetime, and yet fail to produce a single one that goes among the twenties.

There were eight entries of gentlemen's single driving-horses, four entries of matched horses, and four entries of family horses. These did credit to their exhibitors, and were, we are inclined to think, of more real service and more intrinsic value than the nags, which, by dint of what to the uninitiated appeared breaking and running, but by the craft was pronounced *square trotting*, succeeded in reaching the goal in 2.40.

Of this exhibition there were two specimens. In the class that had never made better time than 2.50 there were four entries; and the several heats were trotted in 2.50, 2.50, and 2.51.

In the other class of 2.40 there were four entries; and the time announced for these heats was 2.41, 2.40, and 2.41. This *square even* trotting received the huzzas of the crowd and the cheers of the populace; and yet, to one outside the ring, it does seem passing strange that horses can be so trained that they can be brought to make the exact time, not varying a single second from that made under the most favorable circumstances, and when driven for a record.

There were six entries in the class of slow trotters. This heat was trotted with no fouling, no running, no breaking, in a slow

measured, safe, and steady gait, and was won by Nyms: time, 6 minutes, 43 seconds.

One of the neatest and prettiest exhibitions of the day was the riding of Miss Willard. She, with her male attendant, passed round the track in her flowing robes, the observed of all observers, in a horsemanlike manner, and yet with eminently maidenly grace.

The total receipts of the society the past year are $2,852.85. Total expenses, including premiums, $2,492.85. The receipts exceeded those of last year more than three hundred dollars. The appraisal of the property, real and personal, exceeds the indebtedness by $4,769.66.

One pleasing feature of this exhibition to your delegate was the courtesy shown, and the entertainment afforded him, by Deacon Shepley and Dr. A. O. Hitchcock and his lady.

Horace P. Wakefield.

WORCESTER SOUTH.

The Fair of the Worcester South was held on Sept. 13 and 14. Although near the middle of our first autumnal month, the summer's heat had not passed, the weather was excessively hot, and clouds of dust greeted everybody by the way and on the park. Everybody was good-natured, feeling that dust was the natural element from which we all come, and to which we must all return.

The exercises commenced with the ploughing-match. I did not arrive in season to see the beginning, and but very little of the actual work. I saw the result, and noted the great interest taken in this feature of the fair, not only by competitors, but by spectators. I learned that the society had adopted a new method of awarding premiums, which was this: they offered a hundred dollars in premiums, and those competing should pay ten per cent entrance-fee. The man who paid his ten dollars for the privilege of trying his skill at ploughing meant business. He knew beforehand, from long practice on his own farm, that he could plough well, and was willing to try his hand with his brother-farmers in this class. There were eight entries for the match; and therefore the society really paid twenty dollars in this class. To say that the work was well done is not enough: it was perfect, and it must have been difficult for the committee to award the premiums.

The trial of working-oxen came next; and perhaps this is one of the most prominent features of the show: indeed, it is a specialty at this fair; therefore considerable time was spent with this

class. Never has it been my pleasure to witness such an exhibition. The oxen entered in this class were mostly Devons and grades, although there were one or two pairs of grade Shorthorns.

The rich mahogany red, the long, smooth horns, the bright, intelligent eye, the quick elastic step of the Devon, clearly showed its adaptability to many kinds of farm-work. Its quick attention and obedience to the word of command testified to its thorough training.

In the afternoon trained steers were exhibited upon the track in front of the stand. The tricks and gyrations which were performed by this class, from calves to four-year-olds, would be a suitable exhibition for a gymnasium, and showed remakable patience and perseverance on the part of the trainer; and that intelligence in the bovine race, when developed, can be made useful.

The exhibition of other stock was very creditable indeed,—some fine specimens of thoroughbreds of the various breeds, namely, Shorthorns, Devons, Jerseys. The Devon predominated, both in bulls and cows, and consequently in the young stock.

The sheep on exhibition were only fair in numbers, and small in size, and the specimens only good, not best. Of swine there was a good exhibition, with many fine pigs, some approaching that youthful period in which they are denominated shotes.

The poultry were arranged near the hall. There was a long line of coops; and many and various were the breeds, all having their merits according to the fancy of the exhibitors. Of the beauty and utility of these I am unable to judge, and will only remark that the show was very creditable in this department.

Farm implements were shown near the hall, and were such as are generally exhibited at our fairs, consisting of ploughs, mowing-machines, horse-rakes, &c.

The exhibition in the hall was very good, as a whole, although, from the general scarcity of fruit, there was not a large collection, but very good specimens of the several varieties.

The vegetables were only fair, and would not compare with exhibitions where market-gardening is a principal industry, as it is not in this region.

The exhibition of manufactured articles was quite large; consisting of sleighs, harnesses, creamers, and various other useful articles.

There was quite a large show of bread, and considerable sharp competition, which was due particularly to the ladies. All the varieties common to our tables were exhibited, and it was all apparently good to eat. There was an exhibition of butter and cheese,—not a large display, but of first quality.

The exhibition of household manufactures and fancy articles was full and rich. In this display was combined the useful with the beautiful. Many articles which at the glance seem only ornamental add to the attraction and comfort of home-life, where farmers and farmers' wives and daughters and sons spend a large portion of their lives.

Taking the fair as a whole it was excellent; and I am sure that the State is getting value received for the money paid to this society, and that the fair is evidence of its proper expenditure for the promotion of agriculture, which lies at the foundation of all other industries.

My acknowledgments are due to all the officers of the society, and especially to the president, and the past and present delegate to this Board, for their kind attention, which made my visit to Sturbridge, and the Fair of the Worcester South Agricultural Society, so pleasant; and I congratulate the society on its prosperity as an organization.

H. C. Comins.

WORCESTER SOUTH-EAST.

The Annual Exhibition of the Worcester South-east Agricultural Society was held at Milford, Sept. 25, 26, and 27.

I reached the grounds in the afternoon of the first day, and immediately repaired to the hall, where I found the president, Hon. William Knowlton, so well known to this Board and throughout the State, who took me in charge, introduced me to many of his assistants, and in person accomdanied me to the stock-pens, which we found well filled with Durhams, Devons, Ayrshires, Jerseys, and their grades, nearly all kept for dairying purposes. Jerseys and Ayrshires were largely predominant, embracing many fine animals. A superior Jersey bull from the herd of O. B. Hadwen of Worcester, entered by the president, took the lead. I understand that this animal is soon to render professional service at the Agricultural College. He ought to make a good impression.

I found but few swine and but few sheep; at which I was greatly surprised, as so much of the pasturage within the limits of the society seemed to me so well adapted to the production of mutton. My inquiry for the reason elicited the reply that it was due to the "curse of curs," with which so large a portion of the State is affected. It is hoped by many a good farmer, that some method may be devised by which these and cursing tramps, a kindred nuisance, may speedily be abolished. Is it not the legitimate

business of this Board to attend at once to these two things, and so present them to the present Legislature, that their action may relieve the thousands of families who live in constant dread of the one, and prevent the fear and great destruction arising from a toleration of the other? If it be true that worthless dogs are in excess of sheep (the most profitable stock for a large portion of the Old Bay State) in the ratio of two to one, is it not high time some stringent measures were used to reverse the ratio? The show of poultry was very good.

The exhibition at the hall did great credit to the society, and deserves a more extended notice than in this brief report I am able to give.

The untiring efforts of the ladies were everywhere manifest; but the great interest of the first day centred in a fireman's muster. Twenty-one companies contended for the prizes, aggregating six hundred dollars, with the greatest enthusiasm. The prizes, the vociferous cheering of the four thousand spectators, the doughnuts and hot coffee distributed by the lady-members of the Reform Club and the Woman's Temperance Union, were stimulants sufficient for the 1,244 men who participated in the trial.

I was informed by the president that nothing intoxicating was allowed upon the ground. I certainly saw no indication of any, — a good evidence, that, in this respect, the officers of one society, at least, are the right men in the right place.

At eight o'clock on the morning of the second day a procession, formed in the village, — consisting of teams for the ploughing-match, draught, matched, and fat cattle, trained oxen and steers, and a crowd of spectators, — was escorted by the Milford Band to the field selected for the ploughing-match, near the grounds of the society.

Pen cannot describe the scene presented that beautiful September morning as the long train of cattle, from unweaned calves to large oxen, guided with tenderest care by men whose whitened locks were a "crown of glory," with their sons and grandsons, down to the boy below his teens, with vehicles of almost every description, filled with implements for the day's trial, passed out of the village. Yankee Doodle from twenty pieces, accompanied by the lowing of oxen, the shouting of their drivers, their pleasant greetings, and merry laughter, were amply sufficient to stir even the dull soul of your delegate to a pitch of enthusiasm seldom reached.

There were thirty-one entries for the ploughing-match, which was concluded about ten o'clock, A.M., in a most satisfactory manner. As I examined the well-turned furrows, I did not envy the com-

mittee the responsibility of awarding the limited number of prizes.

The first trial in the exhibition of trained cattle was the backing of a cart loaded with stone up quite an incline, in which, as well as all the trials of the day, it was fully demonstrated that the natural advantages of strength and weight cannot win against discipline; and that prizes cannot be gained by whipping, or the use of profane language.

The next exhibition was one perfectly new to me, and very novel, — one for which I think this society deserves all the credit. A fine pair of steers were introduced without yoke, with hats upon their heads, and decorated with ribbons. They were made to lie down and stretch out as though dead, to stand with one foot upon a stool, to stand with all of their feet upon a stool, to stand upon two stools, — one to stand upon the stools while the other walked under and around him upon his knees, to stand with one foot upon a pivot and turn around, to stand upon a turn-table while the other pushed the table around with his fore-feet, — to jump several poles placed about three feet high, also through a hoop, to walk up a flight of stairs, to stand with one foot hanging over the platform, to sit upon a cushioned stool with their fore-feet upon the first stair, with wooden pipes in their mouths, and hats upon their heads, to the great amusement of the crowd.

Several other pairs showed a high degree of training. A lad not more than ten or twelve years old showed what his patient training had done for a pair of calves only a few months old, and is deserving of great praise. The boy who has so far practised self-control as to teach these useful animals — by many thought to be incapable of any thing, save to drag unreasonable loads, and receive knocks, curses, and goadings from brutal drivers — should be held up as an example worthy of emulation. I was much interested in the trial of walking and fat cattle, the most satisfactory test of the latter being at the tables loaded with every good thing sufficient to satisfy the appetite of the most fastidious epicurean, which might have prompted the speakers in their high encomiums of the enjoyments of farm-life.

So closed the exercises of the second day. I felt that I had enjoyed a model cattle show, and could but wish that every man in the State who holds that an agricultural society cannot be sustained without the excitement of a jockey trot had been one of that vast crowd held from early morning until nearly dark as though spell-bound.

The exhibition of the third and last day, which was to be wholly devoted to the interests of the horse, I was unable to attend.

I can but express my heartfelt thanks to the president for the hospitalities of his home and many kind attentions, and shall ever remember with pleasure all those who ministered to my enjoyment during my stay in Milford.

E. C. Hawkes.

HAMPSHIRE FRANKLIN AND HAMPDEN.

There is so much of sameness in agricultural exhibitions, that it is difficult to write a report of a display, which shall not, with the name of exhibitors omitted, apply almost equally as well to one as another; but in the fair at Northampton there was one feature which truth compels me to say is not usually so much thought of or attended to as it should be. I refer particularly to attentions paid to delegates. Having attended some exhibitions, where, no designating marks being used, I was at a loss to whom to make myself known, and, when known, left to grope my way round "unhonored and unsung," I was agreeably surprised to find that such was not the case at the exhibit of the Hampshire Franklin and Hampden Society. On the morning of the first day a gentleman introduced himself to me at the hotel as especially detailed to accompany me in my visit upon the grounds, and see to it that I was well cared for: so, under the guidance and pleasant companionship of Mr. Stebbins, my visit was made exceedingly agreeable. If questions were to be asked, he was ready to answer; if attention was to be called to any particular exhibit, he was there to point it out; and introductions to members and exhibitors made me feel very much at home where I had else been a stranger.

Upon arrival at the grounds, the usual preliminaries of getting ready were in progress; and in the course of time a very fine display of stock, which, as a whole, was very creditable to the society, was shown; and as an evidence of interest very many of the cattle had been driven several miles in order to compete for premiums, and add to the show. It has been said that "those who live farthest from church are the most regular and prompt in attendance." It may be there were very fine cattle in Northampton; but few, however, were upon the grounds.

Of herds there were specimens of the different breeds, of which many were of unsurpassed excellence. I would very much like to particularize; but it would be difficult so to do, and fearing, while doing justice to some exhibitors, I should unintentionally omit others, it perhaps is better in this report that no individual distinctions should be made.

Being unaccustomed to the sight of Shorthorn stock, the display of that breed was one of great pleasure to your delegate. It seemed to him that no better exhibit could be made, either in herd or singly; and it could not be otherwise, when such well-known breeders as are in the Connecticut valley lent their aid to "swell the list," and compete with each other for a creditable display. Devons, Ayrshires, and the cream-producing Jerseys, too, were there in large numbers, each breed having its friends and their owner enthusiastic in praise of his favorites.

An elderly lady who owned a fancy farm, and was also a great lover of flowers, in the temporary absence of her gardener, one morning called in the aid of her farmer to assist in the garden. He was very unskilful in the ways of managing a flower-garden, and was so awkward, that the good old lady got out of patience, and testily exclaimed, "William, all you are fit for is to trade cows, and sit on the fence and see pigs grow." The display of swine at the exhibition was so good, that your delegate could hardly find fault with any one for sitting upon the fence to see them grow; and the noted pork-breeders of the vicinity must have taken a justifiable pride in their exhibit. Every known breed seemed to have its champion; and, if desirous of "getting the best," the purchaser would be at loss to decide.

There was not a very large display of sheep; but such as there were seemed to be the best of their kind, and reflected great credit upon their exhibitors.

A society having its grounds in the vicinity of large State institutions usually has a great advantage in making an attractive display over those not similarly situated. The Hampshire Franklin and Hampden would seem to be particularly favored in this respect. For with the hospital in its immediate vicinity, and the agricultural college not very far off, your delegate expected to see the fine cattle of both places on exhibition, especially as, at the exhibit at Amherst the year before, a large and creditable display was made from the college. I understood its stock could have been sent without pecuniary loss; but, probably for some reason best known to the authorities, no exhibition was made. Some exceedingly fine specimens of swine, however, were upon the grounds from the hospital.

There was a general mixing up of poultry, not a very large exhibit, but very creditable.

Upon entering the hall there seemed to be specimens of almost every thing usually found at such times and in such places, and every thing was very tastefully displayed. The contributions of fruit, and its arrangement, were grand and beautiful. One feature

which particularly pleased your delegate was the different town exhibits. The table of the Hatfield contribution was liberally and beautifully ornamented with flowers, not thrown together in a heterogeneous mass, but arranged with exquisite taste; and the whole display of individual and collective exhibit was one of which any society might be gratified, as was also the exhibit of persons from other places.

The vegetable department was, perhaps, the chief feature of the display in the hall. I should very much like to particularly mention the contributions of the gentleman who exhibited one hundred and sixty-five varieties, which was such positive proof of his interest in that particular part of the fair; but, as I am prejudiced against individualizing names, the right of guessing is not withheld from those interested. There were fifty-two general entries; and it certainly was a fine exhibition.

The various entries of grain, seeds, flowers, bread, butter, canned fruits, jellies, &c., were numerous and attractive. Among the mechanic art entries was the Cooley Creamery, by the Vermont Farm-Machine Company of Bellows Falls, Vt. Very beneficial results were claimed by its exhibitor, and apparently it is a valuable invention; but its merits could be better appreciated by butter-makers than by your delegate.

Not being very well versed in the merits of dry-goods entries, neither in the pillow-shams, tidies, bead-work, and embroidered skirt-patterns, &c., your delegate does not feel qualified to judge of that department. He only knows there were two hundred and one entries of various articles in that line; and reasoning from the oft-heard expression from fair ladies' lips, "Oh, how lovely!" he takes that expression as *prima facie* evidence that in this department the display was beautiful, and the workmanship excellent.

While looking over a description of Hadley in an old gazetteer, your delegate read that "large quantities of broom-corn are annually raised, and the manufacture of brooms is an important branch of business." Having that sentence fresh in his mind, he was rather surprised that he saw only one entry of brooms, and that by Mr. Edson of Hadley, which, together with the seed shown by him, served to remind visitors of that which was once an important article of industry in that vicinity; and it occurred to the mind of your delegate, that perhaps it might have been more profitable to "the world and the rest of mankind," had broom-corn continued to have been raised, instead of the tobacco-plant. But, as the pursuit of filthy lucre is usually the incentive to producers, it, perhaps, was found that "filthy" tobacco would

line the pocket better than broom-corn. And so, without any advice to those who know their own business best, he asks the farmers to remember the good old days of broom-corn, and the time when the "river-gods" made their annual pilgrimage to the State-house, with, perhaps, tobacco in their pockets, but not in their fields.

A society having its place of exhibit in the immediate precincts of a city or town gives the leading merchants of the place a great advantage in the method of advertising, and adds very much to the show; but your delegate very much questions the legitimacy or propriety of making such places attractive in such manner. A society receiving the bounty of the State is expected by the State to show its success in matters appertaining to the agricultural, industrial, and mechanical results of the contributors, and to make its halls attractive by decoration. Dry-goods or grocery-stores certainly do not add to the resources of the Commonwealth, especially if premiums are paid therefor. A society having its place of exhibition in a rural district suffers very much in display in the hall; and the verdict, "not much of a show," is attributable, sometimes in a very great measure, to the absence of large carpets and party-colored dry-goods suspended from the walls, or huge chests of tea and sugar-samples on its shelves. The show at Northampton was not particularly noticeable for this feature, although there were several Northampton merchants who were shrewd enough to take advantage of this gratuitous and attractive method of advertising their goods among the attendant residents of the rural districts; and a very good display did they make.

Not having the pleasure of acquaintances in the town, a lonely evening was spent at the hotel, varied with an occasional pedestrian exercise upon the sidewalk, viewing the interior of shop-windows. An early occupancy of his room was sought by your delegate, with the thought that the exhibition thus far had been successful, and that the next day the equine exhibit would be to him a source of pleasure; but the next morning, according to his usual custom at such times, the clerk of the weather announced rain; and, after a brief visit to the grounds, your delegate left, with the impression that the Hampshire Franklin and Hampden Society was, in every respect, worthy of the bounty of the Commonwealth.

JOHN A. HAWES.

HAMPSHIRE.

Arriving at Amherst at three o'clock, P.M., on Monday, the 17th of September, the day preceding the fair, I improved a few hours in somewhat the way in which my immediate predecessor did *after* the fair, viz., in looking around on the Agricultural College grounds, without, however, his good fortune in having as escort one of the professors of the college. My call on President Clark in the evening was not only a source of enjoyment, but his account of his work in Japan, assisted by the young men whom he took out with him, and whom this college had trained, suggested a wealth of thought as to what the Massachusetts Agricultural College had laid the foundation for doing in behalf of the wonderful people of that country.

By going to my assigned post thus early, I secured a full day's work on Tuesday, the only day on which the stock was to be exhibited. Through the kindness of Mr. Southwick, superintendent of the college farm, I was set down at the grounds at nine o'clock of this first morning, and had thus an opportunity to watch the arranging of things within the hall, and the gathering together of the animals without. The much-needed rain of the early morning had laid the dust, and the day was cool as well as sunny. This society had not enjoyed the like for many years. The change of the week had brought them the much-desired change of weather.

The show inside of the hall was pronounced the best they had ever had. Although an off-year in apples, the specimens were good, and were plentiful enough to occupy nearly all the space ever allotted for this kind of fruit. Pears, peaches, quinces, and grapes were in abundance. Roots, bulbs, grains, beans, and pease were without stint. One exhibitor had a specimen of wheat like the hundred bushels grown this year on four acres of the college farm. Some of the exhibitors deserve special mention. E. J. Judd had twenty-five specimens of pears. Professor Maynard had samples of grapes from the vineyard on the college farm like the two tons raised this year. He had other fine fruit. Mr. Comins, our brother-member, had sixty-six specimens of farm and garden products. F. B. Paige had from his "melon vineyard" ninety-six varieties of fruit, nuts, berries, &c., forty varieties of which were apples. And our old friend W. L. Warner, whom no one has any hope of excelling, had a hundred and sixty-eight varieties, seventy-three of which were of beans, and nineteen of sweet corn. There were cut flowers on a large scale. There were also large collections of wild flowers of rare beauty. L. W. Goodell of Belcher-

town, and others, had choice selections of flowers. There were also fine specimens of plants and flowers of large growth from the college green-house.

President Clark displayed a collection of Japanese manufactures and photographs, curious articles of costume, papers of great firmness, beautiful hand-wrought silks, window-shades, swords, &c. Dr. Noah Cressy had his cabinet of curiosities, consisting mainly of Indian relics, and articles discovered in or voided from the stomachs of different cattle, horses, and calves. The latter lot he very appropriately labelled "A Poor Dinner." There was a pair of lady's rubbers, about No. 6, found in the animal's stomach, which may have been all that was now to be seen of the party who said, "How shall I flee from that terrible cow?" a hair ball over three inches in diameter, made up in the stomach of a calf five weeks old, butchered in Amherst, supposed to have accumulated from the calf itself by licking, and then swallowing the hair. From similar receptacles the doctor had a piece of bone five inches and a half long, nearly two inches wide, and about half an inch thick; also a well-chewed copper coin, a piece of crockery, and other materials. Among the Indian relics were a fine specimen of an axe-head, an arrow-head, a tomahawk, a chisel, stone pestles and mortars for pounding and pulverizing the corn, &c., and a stone war-club, claimed to be the largest ever discovered.

The show of stock, although not so large as last year, owing to the absence of two or three large herds, was excellent in kind. It was remarked that the proportion of oxen to that of cows was not as large as formerly: still there were good numbers, including some four or five long town teams. Shorthorns, Ayrshires, and Jerseys were most numerous. Of the first-named, the herd of S. A. Bates was particularly noticeable. The Ayrshires and Shorthorns from the agricultural college farm were an ornament to the Commonwealth. There were twenty-two on exhibition; but they were not entered for a premium. The scarcity of Jerseys at this show could not well be accounted for, as it was known that there were a plenty of that breed in the vicinity. The swine were Chester Whites, Suffolks and Chester Whites mixed, and Berkshires. The pigs were very handsome. The exhibition of sheep was not large: Southdowns prevailed. There was a good show of poultry. Among the best were the White Leghorns and Light Brahmas. There were also ducks and geese.

The great feature of the occasion was the after-dinner address of President Clark, to hear which the multitudes were invited in, well filling the spacious hall. Of this address, stirring and bril-

liant as every one knew it would be, the last part was devoted to a description of Japan and the Japanese, — their present status, their interest in and eagerness for improvement, their high consideration of this country, and the promise they give of a bright future. Professor Hitchcock, W. L. Warner, and another, followed in short addresses. Following the meeting in the hall, there was some trotting on the track, and a foot-race.

The second was the horse-show day. It is said to have been a good show, so far as carriage-horses, roadsters, fine stallions, and some other classes were concerned; but still the show of farm-horses was not so good. Not being present on that day, I gathered these facts from a reliable source. I noticed at this fair the promptness to duty of both officers and committees. The hall had needed repairs, which the society had already commenced to make. This is a fine farming region; and the farming interest seems to go hand in hand with the superior opportunities of the location for mental culture. This Twenty-third Annual Cattle Show and Fair of Hampshire is in evidence that this society well merits the continued bounty of the State.

H. Vincent.

HIGHLAND.

According to appointment I attended the Twenty-third Annual Exhibition of the Highland Agricultural Society at Middlefield, Sept. 13 and 14. There were a hundred and eighty head of cattle, consisting of Shorthorns, Jerseys, Dutch, Devons, and Herefords, grade Shorthorns prevailing. The cattle looked well, and would be a credit to any society. The dairy stock was good, a few extra. There was a good show of oxen; and the trial of them on a very heavy load of stones on a drag made quite an excitement. The oxen exerted every nerve to start the load at all. I must here put in my protest against that mode of trial, and recommend that the premium be for the best pair of oxen, taking into consideration their age, training, and the ease of handling a load on a cart. A pair of oxen twelve years old, it was said, had been exhibited year after year at different shows, and taken the first premium. Why? Because they were large, cordy oxen, used to heavy work; but they lost it this year. There were some fine-looking oxen, not so heavy and cumbersome, that I had no doubt would be better farm-workers.

Both coarse and fine wool sheep were exhibited in creditable

numbers. The number of swine was not large, but there were some very fine specimens.

The show of horses was good. Among them were some very fine-looking, easy-stepping animals; yet the track was so uneven, and extremely dry and dusty, that it was impossible to judge much of their speed or road qualities.

The show of vegetables was very good; that of potatoes was excellent. One squash, weighing a hundred and forty-four pounds, came down from Washington, and stood proudly among its neighbors, showing, how things grow up there. We saw many looking wishfully at the plates of peaches and grapes in the collection of fruits. The splendid boxes of yellow butter, home-made cheese, and maple-sugar, were very nice. The ladies' department was very fine. The society held a meeting in the town-hall on the evening of the first day, at which Dr. Lucas of Chester gave an extended account of a business-trip to some of the Southern States. While it was interesting, it varied somewhat from an agricultural speech. Good music by the Hindsdale Band, and short speeches by other speakers, soon finished out the evening. The president presided with ease and grace. The dinners were provided in the society's dining-hall by the ladies of the Baptist Society, at a cost of only fifty cents per dinner, which was abundant and well-cooked. A former member of the State Board said, while eating his dinner and looking at the lady-waiters, "I think this would be a good place for a young man to come for a wife."

The president, C. Fay, Esq., and officers and members of the society, all worked as one family to make the exhibition worthy the patronage of the State; and the kind attentions extended to the delegate will be remembered with gratitude.

ELIJAH PERRY.

UNION.

I visited this comparatively young and vigorous society at its Annual Exhibition, held on its grounds at Blandford, Sept. 19, 20, and 21.

On arriving at the grounds, I was met by F. C. Knox, Esq., member of this Board, who very kindly gave such information in reference to the different departments of the show as was desired.

This society owns some ten acres near the centre of the town, very pleasantly situated, and commanding one of the finest views

in that section of the State. It has a commodious hall, barn, scales for weighing, and other conveniences. The hall has been enlarged the past season, giving the society good facilities for getting up dinners; a good dining-hall, with a good exhibition-hall above.

There was a large and fine show of stock, especially of working-oxen and steers. Some fifty yoke of as fine-looking cattle were shown as one often sees at our fairs; Lewis C. Nye taking the lead with five yoke of grade Shorthorns from one to five years old, and weighing, in the aggregate, 14,455 pounds.

There was no exhibition of ploughing, neither was there any trial of working-oxen on the cart. I was sorry to see those noble oxen tested on the stone drag, with the enormous load of five tons. That, in my opinion, is not the place to show the training and good working-qualities of our oxen. There is no place in which the farmer uses his oxen as much as on the cart, and there is the place to exhibit the oxen at our fairs. If oxen will handle the cart with a proper load, draw, back, and set it where you want it, in good style, you may be sure they will draw all the load you should require of them on the drag; and I hope our societies will discard the stone drag at our fairs, and use the cart to show the noble qualities of the working-oxen.

Trained steers were exhibited, which did credit to themselves and to their trainers. Some very fine beef cattle were shown. The dairy stock was good. Some fine animals were shown in this class. H. K. Herrick, president of the society, exhibited Shorthorns; G. G. Rowley and F. C. Knox, herds of Jerseys; E. W. Boise, secretary of the society, exhibited Ayrshires. One of his cows had not been dry since 1870, and had made over four hundred pounds of butter in one year, besides the milk used in the family. Others had good animals on exhibition.

There were a few fine bulls of the different breeds. The show of sheep and swine was not large; but there were some good specimens of each.

The different varieties and breeds of poultry were shown in good numbers.

The exhibition in the hall was excellent. The collection of garden vegetables, grain, fruit, &c., was very fine. The ladies' contributions to this fair were worthy of great praise. Butter, cheese, bread, canned fruit, preserves, household manufactures, needle and ornamental work, worsted work, paintings, drawings, flowers, and, in fact, most every thing useful and ornamental, were shown.

At the proper hour we repaired to the dining-hall, where a goodly number of ladies and gentlemen assembled, and partook of

an excellent dinner got up by the society. The second day of this fair was devoted to the exhibition of horses, of which there was a very good show, consisting of stallions, brood-mares with their foals, one, two, and three year old colts, and gentlemen's driving-horses, with the inevitable horse-trot in the afternoon.

The third and last day was principally devoted to trotting, and an address by Rev. Washington Gladden, which closed the exercises of this fair.

This society is comparatively out of debt, seems to be doing a very good work, is well officered, with a good degree of interest in the welfare of the society.

Nathaniel Upham.

HAMPDEN EAST.

The Quarter Centennial Exhibition of this society took place on the society's grounds, at Palmer, on Tuesday and Wednesday, Sept. 18 and 19, and was generally said to be one of the best exhibitions held for many years, especially for cattle, of which grade Durhams predominated. A new variety of field-corn, called "Compton's Early," grown by Mr. J. K. Knox, was shown. Much is claimed for this corn, both for early maturity and great yield; one hundred and eighty-one bushels to the acre having been ripened in seventy-six days after planting. The seed can be obtained, it is said, of Mr. James J. H. Gregory of Marblehead.

Mr. A. R. Maxwell of Monson exhibited a hundred and forty varieties of vegetables; and the State Primary School was a large contributor of vegetables, flowers, cattle, sheep, swine — and boys and girls.

Notwithstanding the comparative prosperity of this society, we could not help feeling, that, as a rule, we have too many small local societies, and that here, as elsewhere, union is strength. To us the advantages of one strong central society more than balance the disadvantages of longer distances from the place of exhibition, — the chief argument for local associations. We can but think that three societies in Berkshire, eight in the river counties, six in Worcester, three in Plymouth, and two in Bristol, are more than the best interests of agriculture require. We may not be entirely orthodox in this respect; but the present financial condition of some of our numerous societies furnishes a striking contrast to the one society of the whole County of Essex, which has to-day a

fund of over twenty-five thousand dollars at profitable interest, and, as your delegate last year reported, is second to none in the Commonwealth as a model agricultural society.

EDMUND H. BENNETT.

FRANKLIN.

I was assigned as delegate to the Franklin Society, whose exhibition was held at Greenfield, Sept. 28, 29, and 30, 1877.

Arriving at Greenfield on the first day of the fair, I was kindly met at the station by the delegate to this Board, who at once took me to the grounds, and, by his courteous attentions, did much to render my visit pleasant and agreeable.

My first impressions were somewhat modified by *dust*, which was so omnipresent, that I hardly needed to be told that an excessive drought had prevailed for weeks, parching fields, drying up streams, and so affecting the quality of stock, that several of the best herds were not on exhibition. A Franklin-county farmer is so sensitive to the reputation of his stock, that, if he cannot exhibit it in its best condition, he will not show it at all. Hence the present exhibition in this department, although good, was not equal to that of some previous years. But a pair of Shorthorn oxen was shown, weighing 4,515 pounds, and three pairs by one contributor, weighing respectively 4,095, 4,010, and 3,790 pounds. From one herd of ten cows (Jersey) 2,198 pounds of butter had been sold in three months and a half, and some of the cows were dry a part of the time. One cow four years old claimed to have furnished her owner with twenty pounds of butter in one week. Seven calves had just been sold from a herd for prices ranging from fifty to seventy-five dollars each. The same owner had sold a heifer for four hundred dollars.

Jerseys, Shorthorns, Devons, and Ayrshires were well represented; and one herd was said to contain as many kinds as "Noah took with him into the ark." Whole number exhibited three hundred and fifty-one.

The exhibition of swine was the best ever made by the society, and largely consisted of thoroughbred families of young Poland Chinas, Chesters, Essexes, and Suffolks. One contributor showed eleven pigs, nine weeks and three days old, that averaged over fifty pounds each. There were twenty-four entries. One venerable hog was dignified with the name of "William Penn;" and the "Queen of Sheba" was present, with a litter of her pigs. We

question the taste of selecting names that have come down from the past immortalized by distinguishing qualities of character, and associating them with even so useful a brute as a hog.

The department of sheep was creditable, there being two hundred and eighty-one specimens on exhibition. One Cotswold buck, weighing two hundred and seventy-five pounds, was shown with his progeny, each of which furnished over twenty-five pounds of wool the past year, and whose lambs averaged one hundred pounds. The "Moody and Sankey" sheep, imported by the great evangelist, attracted much attention.

There were one hundred entries of poultry, representing the most desirable kinds.

The second day opened with a drizzling rain, at times culminating in hard showers, which, although very acceptable in laying dust, is one of the most unfortunate accompaniments of a cattle show, and interfered very much with the day's success. Nevertheless, there was a remarkably good show of horses; there being nearly one hundred of the various kinds for personal and family use exhibited, and some fifty colts.

The display in the hall was of a high order, both in its arrangement, and in the variety, quality, and aggregate of the several departments. The arrangement has for many years been under the direction of one man, whose good taste and skill were apparent in so grouping together articles of utility and beauty as to produce the most pleasing effect on the observer, and in so classifying the fruits, vegetables, fancy articles, &c., as to diminish the labor of the several committees.

There were four hundred and fifty entries of fruits, seventy of vegetables, two hundred and seventy-one of fancy articles, eighty-three of domestic manufactures, fifty-three of bread, fifteen of butter, sixty-five of fine arts, and sixty-four of flowers.

The last day — being a benefit day, so called, and specially set apart for the "sports of the turf" — opened clear and pleasant, and, with a large crowd of people, saved the society from loss, and rendered the fair, in a degree, financially — as it certainly was in all other respects — a success.

The receipts of the year from all sources have been, as per Secretary's Report, $3,590.92; the expenditures for same time, including interest on society's debt of $2,000, $3,571.73; leaving a balance to the credit of the society of $19.19.

George M. Baker.

BERKSHIRE.

The Sixty-eighth Exhibition of this society was favored by three fair days; and the attendance upon each day was very large.

The show of neat-stock was fine, particularly of pure-breds. Among the large entries of herds that have a fame beyond the limits of the society were the Ayrshires of Theron L. Foot, president of the society; the "Maplehurst" herd of Jerseys of Thomas Allen; the Dutch of Isaac Anger (representing the society of Shakers); and the Devons of Simon H. White.

The grade dairy stock embraced many superior animals; but a considerable number seemed to us to owe their merits to chance, rather than to careful breeding and a long-continued selection of the "fittest."

The fat cattle, working-oxen, and young cattle were good, and had been well kept; and most of them appeared to have been well bred.

The show of sheep was extensive (including most of the popular breeds) and of marked excellence.

There was a large number of good horses on the grounds. The appearance of most of those on exhibition, whether for speed or in other classes, indicated considerate owners. It was noticeable that so many were of good size. Speed, which paradoxically leaves so little behind for owner or any one else, has not stampeded the strong and serviceable horse from this society.

Of swine there was a good exhibit. A new and well-modelled poultry-shed, costing some three hundred dollars, was well filled. Fifteen horse-teams and one ox-team competed at the ploughing-match.

A very great interest is manifested by this society in the cultivation of grain. The entries as "summer" and "fall" crops numbered nearly three hundred, of which a hundred and eighteen were for corn. Awards paid, a hundred and ninety-one dollars.

The show of vegetables was remarkable, both in quality and quantity; the hundred and five entries affording but a partial idea of the extent of the exhibition. One contributor, Mr. Delvill Smith of Lee, showed two hundred and ten varieties, and all grown on one acre of land. The butter and cheese were good. On account of the unfavorable season, the show of fruit was not as large as usual; but there were many fine specimens of apples, pears, peaches, and grapes.

In no department of the exhibition was a genuine interest more apparent than in that of the ladies. The space in the hall allotted

to them was completely filled, and the display was very fine and attractive. The eloquent and fascinating address of Rev. O. P. Gifford will well repay a careful perusal.

From what I saw, and from conversation with farmers, I was fully satisfied that this society is working very successfully to promote the object for which it was organized. This conviction was strengthened by what I did not see. There was no useless display, no effort of questionable expediency to simply make an impression, no exhibit that seemed to have been prepared for the occasion, nor a society dinner, that sometimes interferes so much with the legitimate purposes of an agricultural fair.

Your delegate is under many obligations to the officers of the society, and to Mr. Merrill of this Board.

A. H. Holland.

HOUSATONIC.

I attended the Housatonic Cattle Show held at Great Barrington Sept. 26, 27, and 28. I started so as to reach Great Barrington the evening of the 25th, believing it to be the duty of delegates to attend promptly to the duties assigned them, and equally the duty of societies to notify the delegates of their programme, and the chances of reaching their destined places in time to see all.

Early in the morning of the first day I found my way to the grounds, about three-fourths of a mile from the village, on a pleasant street, and watched the coming-in of the stock and people. There were nearly two hundred head of cattle soon on the grounds; and the people numbered from six to eight thousand during the show. Many of these people came from their farms in the mountains and valleys, in wagons, with two horses and whole families, which to me was a pleasant sight.

The society's grounds consist of thirty-five acres of excellent land, extending from the main street to the river. Adjoining the river is a large field, where cattle that come in the day before, and many that come early in the morning, are turned to feed. At the southerly end of this are the cattle-pens; west of this is the half-mile track, with its judges' stand; still on towards the street is the large two-story hall, with a basement nearly above ground; south of this, at the side of the lot, are the pens for sheep and swine, also the poultry building, I think some eighty feet long and twelve feet wide, with rows of stationary coops through the centre all alike. The sides of the building take out, allowing good light and

air. At the north-west portion of the grounds are a number of cooking and eating houses, rented to such persons as will furnish a respectable meal at a reasonable price.

The society owns these grounds, buildings, fixtures, and track, free from debt, with some six hundred dollars in the treasury. It was apparent that the success of this society is mainly due to the united and persevering energy of its officers and members, who are determined to leave nothing undone for comfort and success. The members do not choose their officers, then leave them to do the work. It is united action.

The show of cattle was very good: among them were some very fine steers and young oxen; but of their training I could judge but little. I would suggest that it would be well for the society to offer a premium for the best trained steers, also for the best team steer. The older oxen here, as in Middlefield, were hitched to a heavily loaded stone drag, which did not show the qualities of the oxen. The same twelve-year-old oxen that were at Middlfield put in an appearance, and the same driver; who, to say the least, would not be a credit to a society on account of his noise and whipping.

The show of all kinds of horses was good, and I was pleased to see a good number of walking-horses. Good and fast walking should be encouraged. All the exercises on the track were well managed. Sheriff Root was chief marshal, and in his gentlemanly, good-natured way, kept excellent order. The grand tournament (catching the rings on horseback) attracted a large crowd; and while it might be termed a side show (and in fact I think the purse was made up outside of the society), yet it was a pleasing pastime. The show of sheep, swine, and poultry, was good. There were nineteen entries of agricultural implements: among them the New-York Plough Company made a good display. At the ploughing-match ten teams entered; and all the work was good, considering how extremely dry the ground was.

Under the head of seeds there were a hundred and eight entries, including the various kinds of grain. The vegetable show was quite good. There were thirty-three entries of splendid butter, and sixteen of cheese: I would willingly have accepted fifty pounds of either of these lots. Among the various kinds of fruits stood beautiful plates of peaches, of whose good qualities I would have willingly been called upon to judge. There were a hundred and twenty-eight entries of the various kinds of bread, which looked tempting. The committee on painting and fancy-work, in their report, say they found it no easy task to determine superiority of merit where some two hundred specimens were on

exhibition: I thought as much. There were some three hundred and twenty entries, mostly of ladies' work. The exhibit of flowers was large and beautiful, yet there was a lack of room to show to advantage. With the energy manifested by the members of this society, that want will not long be felt. One interesting feature of this exhibition was the portraits and large photographs of the former and present officers of the society hung around the upper hall.

My duties were made doubly easy by the attentions of the president, A. L. Hubbell, Esq., and other officers and members of the society. Sheriff Root, and Messrs. Fenn and Merrill of this Board, were untiring in their attentions, for which I tender my sincere thanks.

ELIJAH PERRY.

HOOSAC VALLEY.

I attended the Eighteenth Annual Cattle Show and Fair of the Hoosac-valley Agricultural Society, held at North Adams, Sept. 18, 19, and 20, arriving at the grounds of the society about noon on the first day of the exhibition. One of the first to meet me was the secretary, who extended a cordial welcome. President Archer and Secretary Bliss were extremely busy in arranging the details of the exhibition. I saw at once this was a live society. The officers and citizens, including a large numbers of ladies, were actively engaged in arranging the articles for exhibition, to display them to the satisfaction of the exhibitors, in a manner pleasing to spectators. In charge of High Sheriff Root and Gen. Foster of Cheshire, I had an excellent opportunity of witnessing the entire exhibition, which, I am pleased to say, more than met my expectations; and I assure the Board that the six hundred dollars which this society receives from the State is not unworthily bestowed.

The following list of entries indicates the number of animals and articles on exhibition, which were all of good quality, and some of them very superior: Of farms, summer crops, &c., 121 entries; of fall crops, 157; of hall entries, 679; of domestic animals, 266, making a total of 1,223 entries; and the amount of premiums distributed over nineteen towns was $1,226.

The domestic animals were not as numerous as I had hoped to see. In some departments they were quite deficient, especially in fat cattle, working-oxen, and thoroughbred stock. The show of poultry was quite large, all of which was of more than average

excellence. I am indebted to the efficient secretary of the society, H. Clay Bliss, Esq., for the following historical facts: —

The society, with all its prosperity, has met with some reverses. It received its charter in 1860, and purchased its grounds, which contain about fifteen acres, in 1862, at a cost of twenty-nine hundred dollars. A good half-mile track was built, and suitable buildings erected for use. The society has suffered from freshets at three different times. The Hoosac River, that runs parallel with the grounds the whole length, is a very rapid stream; and, when heavy storms and spring thaws come, the water from the mountains empties into the river, causing it to swell very rapidly, many times causing great damage. At the second wash-out they were obliged to change the location of the track and buildings at a cost of about fifteen hundred dollars.

About six years ago the grounds were again badly damaged by still another freshet; and they were compelled to build a dike on the bank of the river, nearly the whole length of the grounds, the expense of which was about twenty-two hundred dollars.

At the present time there is erected a fine exhibition-building, in the form of a cross, a hundred and forty feet long by thirty feet wide, with ells on sides, thirty feet from front-end, thirty feet square, and all in one room. In the centre of the building there is erected a platform, enclosed with a neat railing, which is used for a speakers' stand and officers' headquarters, forming one of the best exhibition-rooms of its kind I have ever seen. Adjoining this is a dining-hall twenty by sixty feet. The stable for the accommodation of horses contains fourteen stalls, with a loft for hay, grain, and straw. The total valuation at the present time is $12,500; indebtedness, $5,800. The society numbers about five hundred life-members.

The farming-interest has undergone a decided improvement since this society was organized. The farms are kept up in better condition, and made more productive. The stock, if not increased in numbers, is decidedly of an improved quality. Poultry, here as well as elsewhere, shows a marked improvement. This society necessarily is conducted upon about the same plan as most other societies at the present time. The old plan, of simply exhibiting the products of the farm and the handiwork of the farmers, would very soon fail of support, unless other interests were brought in to make the exhibition more attractive. In order to have a good cattle show, it is absolutely necessary that there should be a large gathering of people. To keep up interest, nearly all societies are obliged to resort to what are called horse-trots, balloons, base-ball playing, band tournaments, or something of the kind, to draw the

people, and get money enough to pay the liberal premiums which are offered and paid the farmers for their exhibits. The ingenuity of officers of many societies is taxed very hard to keep up interest enough to obtain funds sufficient to keep on prospering.

The farmers, as a class, think too much of the premiums, and overlook the great object for which agricultural societies are organized, viz., the gain of knowledge from the experience of their neighbors, how to get the best results for their labors and investments.

Every exhibitor should state to the committee appointed to award premiums the way and manner in which he conducts his farm, how he goes to work to raise his animals and farm-products, what kind of land he has, and the kinds of manures used. Such information as this, communicated to the several committees either verbally or in writing, which would be far better, the committee could incorporate in their report; and it would then find its way into the printed transactions, and whoever would take the pains to read it might be benefited. They would be very likely to follow some of the suggestions, and in many cases to their advantage. There is no good reason why the farmer should not make every effort to bring the products of his labors to perfection, as well as the manufacturer; but quite too many are satisfied with a common or perhaps an inferior production.

I must here make mention of the address, on the second day of the fair, by Professor S. T. Frost of Amenia, N.Y., subject, "The Waters of the Earth and Air." It was an able and scholarly effort, and, though rather of a scientific nature, contained a fund of information interesting to all his hearers, and valuable to farmers.

In closing, allow me to express my thanks to the officers of the society for the kind attention and hospitality shown during my visit.

E. T. Lewis.

BRISTOL.

As a substitute for the regular delegate, I attended the Bristol-county Fair, held at the city of Taunton on the 26th of September, 1877.

The immense concourse of people attending the fair had full scope for gratification and amusements, as, in the varied depart-

ments, no one could fail of being interested in some of them. Every exertion was made on the part of the officers to make the fair a success.

In a former report, as delegate to this society in 1873, I described the beautiful and extensive grounds and buildings: all are now apparently in as good order and condition as ever.

The arrangements seemed to be all good, except for the cattle, where system appeared to be overlooked or disregarded. They appeared to be inconveniently mixed. Animals, and especially those of pure breeds, thus displayed, are very confusing, both to the judges and spectators; and it would seem that the duties of the committees were thereby rendered unnecessarily more arduous.

There was a large and fine display of horses, cattle, sheep, swine, and poultry, and large contributions of fruits, vegetables, and flowers, and of all local industries, too extensive to enable me to particularize. Many of the contributions were of rare excellence, a sure indication of good agriculture.

The fair of this society is one of the largest, and the best managed and best patronized, of any in the State; and it is stimulating good farming throughout the county.

O. B. Hadwen.

PLYMOUTH.

The Fifty-eighth Annual Exhibition of the Plymouth-county Agricultural Society was holden at Bridgewater on the nineteenth, twentieth, and twenty-first days of September, three most beautiful days. Your delegate arrived on the society's ground the morning of the first day. Every facility was given him to examine the exhibition in all its departments. The ploughing-match took place on the first day: nine horse and six ox teams contested for the prizes. A good degree of skill was manifested in the match. The work was well done, and in a reasonable time: the ploughs used were the most approved patterns. A swivel or side-hill plough did good work; and a sulky plough, from its novelty, attracted the admiration of the crowd. The application of the harrow as a test of the skill of the ploughman and of the plough, in leaving the furrows in a state to be easily fitted for the crop, was a new feature in the exhibition, and was admired by your delegate. The trial of draught animals was next in order. Thirteen yoke-oxen and ten horse-teams contested for the prizes. All showed remarkable muscular power

and careful training, handling their loads with apparent ease. An exhibition of fast-walking oxen on the track, nine pairs, elicited no little interest in the spectators; also a pair of trained steers, admired by all. The display of pure blood stock in the pens and sheds was unusually large. Jerseys were most numerous; but the Ayrshires, Guernseys, and Shorthorns were well represented. More than a hundred animals in this class were presented for premiums; and but few natives or grades were offered. The herds of I. F. Leach, and of the Messrs. Hayward, with the beautiful Guernseys of Albert Howard of West Bridgewater, were greatly admired, together with many beautiful single animals. The display of bulls of different breeds can hardly be excelled. The show of milch cows and heifers was good. A few pairs of working-oxen and steers were exhibited, and only eight entries of fat oxen, and a small number of fat cows, none of which were of superior size or quality. As a whole, the display of cattle was good.

The sheep consisted of some fine specimens of Southdowns, Cotswolds, and other grades, — eight entries in all. There were thirty entries of swine. The Chester Whites, Essex, Suffolk, and Berkshires predominated. Two pigs were shown, weighing seven hundred-weight each. The show of poultry was large, with about two hundred and fifty coops, embracing all the most useful and fancy breeds, also fancy pigeons, ducks, and geese in great variety, turkeys, &c., many of which were superior.

The first exhibition of gentlemen's driving-horses on the track was that of five pairs, evidently driven by their owners; and all were superior in style and action. Of family horses only five were shown, all worthy of a premium. A stallion owned by Leonard Richmond of Lakeville was superior in style and action, and particularly worthy of note. The display of brood mares and colts was large; and more than forty were exhibited on the track at once. Many of them were from the best blood in the country, showing increased interest in the rearing and development of this most noble and useful animal.

As a whole, the exhibition of horses, cattle, sheep, swine, &c., was highly honorable to the competitors, and to the society and county they represented so well.

The horse-trots were had at intervals from day to day, and were more remarkable for the number of spectators than the speed of the animals. All the races were well contested.

In the hall of manufactures there was but a small display of agricultural inventions and implements, but few were superior; and there were only seven entries for premiums. The cereals made but a small display; but of farm and garden vegetables there were

eighty-six entries of the usual varieties raised, many of which were superior specimens.

The show of fruits was not large. There were sixty entries of apples, forty-eight of pears on a hundred plates. A few plates of beautiful peaches, twenty-one of grapes, and a few boxes of cranberries, were all of good specimens. Of dairy products, the cheese display was small; and only seven samples received any particular attention and award. There were seven tubs of most beautiful "gilt-edged" butter, very tempting to the eye. There were many fine specimens of bread, honey, preserves, canned fruits, and jellies, — sixty-eight entries in all. Cut flowers and pot plants were numerous, all beautifully arranged in forty-eight entries There were a hundred and seventeen entries of domestic manufactures, and a hundred and seventy fancy articles for exhibition, most of which received a premium. Every conceivable article which could in any way contribute to the comfort of the old or young could there be found, and on no similar occasion has your delegate seen so great a variety of useful articles exhibited.

The art gallery was graced by the productions of the best native and foreign talent in paintings, drawings, crayons, *pastels*, photographs, all arranged with taste and skill (a hundred and eighty-six in all), many of which were of great merit. The high schools of many towns were represented in a display of ornamental map and geometrical drawings, which attracted universal admiration. The society's dinner was served in the hall, where about five hundred assembled, and partook of the sumptuous repast. It was of the most social character: all appeared happy. The after-dinner speeches by citizens of the Old Colony were short, pithy, pertinent, humorous, and witty, and were listened to by an appreciative audience.

On Friday a grand carnival was announced to take place. No one knew, and all were anxious to learn, what it would consist of. Curiosity was on tip-toe from early morn until high noon. The grounds and every avenue leading to them were filled by an anxious crowd, adding largely to the receipts of the society. What the carnival was, I leave to the imagination, and will not attempt to describe.

The Plymouth Society stands in rank and wealth among the best societies in the State, — an honor to the county she represents, and to the State.

D. B. Fenn.

HINGHAM.

Your delegate was unable to visit Hingham till the second day of the fair. That day, Sept. 27, was all that could be desired for such an occasion.

The exhibition was highly creditable in all respects, — in what was there, and in what was *not* there.

There was some good stock, sheep, and swine; and the numerous flocks of ducks convinced one that he was near plenty of water. The poultry and pigeons were of good stock, and in large variety of good specimens.

The care with which the ducks were provided for was worthy of praise; for each little flock had its pool or cistern sunk in the ground, where it could "dabble in the mud," and be happy. But, passing along to the poultry, we found one long line of cages, into which the hot sun was pouring his rays, while the poor fowls were panting for breath. They were suffering, while those in the shade seemed full of enjoyment. When the dumb animals are adding to our enjoyment, let us see that they have their share, or at least that they do not suffer for want of a little thought on our part.

The hall was well filled with products of field and garden, and various articles of handicraft, showing that the inhabitants of this interesting old town are thorough Yankees. There was woodenware turned out with magic swiftness by the improved machinery of our times; and by the side of it were stout hand-made pails and piggins, made by the careful hand of one of those prudent, unchanging workmen who can make a silver quarter go as far in living as another man can a gold dollar, and who believes that one of his hoops fastened with wooden pegs is better than any of the new-fangled machine-things when fastened with brass and iron. And that others partly agree with him was shown from the fact that almost, if not quite, every one of his articles was marked "sold." There was another pail that made one's eyes ache to behold, and fingers ache in sympathy for the man who joined its thousand of pieces together. It takes its place with the quilts of thousands of pieces, and other articles, that consume an immense amount of time in their manufacture, and, when finished, are not valuable for use, or as works of art. They are simply curious. I never can see such exhibitions of patience, labor, and skill, without wishing that they were better directed.

The schools were well represented by drawings, the work of the pupils; and there was a "children's department," where the little ones showed their interest in agriculture and horticulture

by a large display of vegetables and flowers such as children would naturally choose to raise. This feature of the exhibition was worthy of high commendation.

One of the negative excellences of the exhibition was the omission of the "horse-trot." The Madawaska cavalry furnished all the fun which the youngsters needed, when the old folks did not crowd them out of sight. Some wonderful exhibitions of horsemanship closed the exercises of the day. When our Indian tribes, and the present condition of life on our plains, have passed away, probably no such riding will be known. It may be well to say to our descendants who shall conduct these fairs a hundred years from now, that we had riders who could lean from their saddles, and pick up one article after another from the ground, while the horse was in full galop; that, on one side of the horse, all that could be seen of the rider was one foot above the saddle, and his head and hands below the horse's belly as he gathered the objects along the way. The feat would seem to be incredible.

But it would not be in good taste to forget the dinner and the speeches. The dinner was excellent, your delegate knows; and, that the speeches began and ended well, everybody will know, when he says the first was made by President Hersey, and the last by Secretary Flint of our Board. That there were some equally good ones sandwiched between them will be inferred, when we mention these among the speakers, — Hon. John D. Long, Hon. B. W. Harris, and Hon. J. B. D. Cogswell.

The whole exhibition was a success in its kind, and was thoroughly enjoyable in all respects.

P. A. Chadbourne.

MARSHFIELD.

I attended the Exhibition of the Marshfield Society, on the 3d, 4th, and 5th of October, as the delegate from this Board. The weather on the first and last days proved unfavorable; but it did not dampen the ardor of the hardy farmers and horticulturists of this flourishing society; and the attendance on the second day was unusually large. I had just enough of the blood of our Pilgrim Fathers flowing in my veins to enjoy a visit to this ancient town; and I esteemed it a pleasure, because of its sacredness as the home and the resting-place of the patriot and statesman, Daniel Webster, who had devoted long years successfully to develop the agricultural resources of this Old Colony settlement. The farmers

of this section of the State have always shown a great veneration and love for Webster.

The ploughing-match and the trial of oxen were the first events of Wednesday morning. These attracted large numbers, and were decidedly among the most pleasing features of the day. The large hall upon the grounds of the society, having many attractions, was crowded throughout the day. There were exhibited upon its extensive tables ninety varieties of well-ripened grapes, mostly of the open-air varieties. But few contributions were made of those grown under glass. The space allotted to apples and pears was filled with the excellent varieties usually grown here. Much interest is shown in the culture of fruit in Plymouth County, and several beautiful collections were on exhibition.

A commendable interest was manifested by the farmers' wives and daughters in exhibiting excellent varieties of brown and white bread; and about a dozen samples of plain and sage cheese were shown, and some fifteen lots of the best quality of butter. I will refer here to the rich golden butter of the famous "Jersey Belle," exhibited by Mr. C. O. Ellms of Scituate, which the owner took commendable pride in showing. The cream from the milkings of this cow, Sept. 29 and 30, made three pounds, fourteen ounces and a half. The cream in a jar of the milk stood an inch in thickness.

The floral designs were beautiful. A large portion of one of the tables was set apart for this purpose; and that which attracted the greatest attention was the Old Oaken Bucket, by Mr. Alfred Phillips. It was a floral representation of Woodworth's poem, so dear to the heart of every rural dweller, and was highly appreciated.

The department of manufactured articles was largely represented, and showed that the ladies of this section of the State were not to be easily outdone. The fancy articles comprised a long list. Among the noticeable articles of floor-coverings was a rug made by Sarah B. Besse, a lady of thirty years of age, and several pieces of patchwork by Mrs. Alfred Sampson of Duxbury, thirty-two years of age.

The farm-products would have done credit to any agricultural society in Massachusetts. Four long tables were covered with the products of the soil. Such a display served to impress one with the comforts and independence which attaches to the pursuits of the farmer. The exhibition of field-corn raised by F. P. Arnold of Pembroke was excellent, — specimens of a yield of one hundred and seven bushels to the acre. The land was fertilized with six cords of barnyard-manure to the acre; home-made phosphate

being used in the hill under the seed. The town-farm was represented by a good collection of vegetables. The display of the products of the reclaimed marsh-lands, which were grown without fertilizers, showed very favorable results. A premium was awarded to George P. Peterson for evergreen sweet corn raised on the marsh. One thousand bushels of oats, and a large quantity of wheat and barley, had been raised on these lands the past year. The principal contributors of marsh-products were Edwin White, C. S. Goodhue, N. H. Whiting, G. P. Peterson, Thomas P. Ford, and E. R. Church, showing that the diking project had been successfully tested.

On Thursday the stock-pens were filled with a fine lot of cattle. Albert Tirrell exhibited Ayrshire and Jersey heifers and cows; and the premium Jersey bull "Smuggler," by Baily and Calvin Chandler, attracted much attention.

The points in the "Jersey Belle" were explained by the owner, Mr. C. O. Ellms; and her products of butter and milk shown were the proof of his statement. When in full milk last spring, her udder measured on the umbilical line five feet and one inch around, and the width of escutcheon was eighteen inches. She is believed by good judges to be the best cow in this country. Her record will be found in "The American Jersey Herd-Book," vol. vi., and her progeny in the seventh volume of the same work. Mr. Ellms has refused an offer of five thousand dollars for her. Parties in Europe are seeking to purchase her.

The show of fat cattle was good, and contained several yoke of large oxen, three fat cows, and a fat ox. Working-oxen and steers were not numerous. There was a fair average of horses, and some half-dozen good colts.

On Wednesday, at about noon, a procession was formed, and marched under martial music to the spacious hall, where nearly five hundred partook of a sumptuous farmers' dinner. At its close, George M. Baker, Esq., its efficient president, called the company to order, and furnished the audience with an interesting and instructive account of the rise and progress of the Marshfield society. He believed the twelve hundred acres of the reclaimed marshes of North River would be made to produce the large crops represented; and if an acre of that land will produce thirty bushels and more of rye, another, forty bushels of oats, and another, three tons and a half of hay, without fertilization save its own inherent qualities, the query he desired each to answer, was, "Why will not the twelve hundred acres of the same land, under similar circumstances, produce like results?" A massive cross of dahlias with other flowers was at this time brought to the

platform, and tendered as a token of personal esteem to the president.

Several distinguished speakers were present. Mr. Speaker Long gave a humorous address relating to his experience in agriculture. Hon. H. B. Peirce, Hon. Thomas Russell, Edmund Hersey, and others, delighted and instructed the audience upon the great subject of agriculture. Most of them spoke in praise of the enterprise of the Marshfield farmers in the project of reclaiming the extensive marshes of that town. Judge Russell spoke in the highest terms of the old-fashioned cattle shows of this Commonwealth, and said, that, barren as are the sands, the Plymouth boy loves them, because he believes that the men who were the first settlers here, although in their honored graves now, cannot fail to be a fruitful lesson to the rising generation.

The fair closed on Thursday; and it is but just to say that rarely does a society display greater enterprise, where every man, woman, and child seemed more desirous of helping along the exhibition.

S. B. Phinney.

BARNSTABLE.

The Thirty-fourth Exhibition of the Barnstable Agricultural Society was held on the society's grounds, in Barnstable, Sept. 18 and 19.

Your delegate arrived on the grounds on the morning of the second day. The weather was all that could be desired; and it called out a large gathering of people, whose happy countenances indicated that they fully realized the advantages of an agricultural fair.

The stock department was first visited. The whole number of entries in this department, including twenty-one of poultry, was seventy-three. Of cows there were several fine animals of the Jersey breed. Three heifers of the same breed had strong marks of promise. Only three bulls were exhibited, one of them a fine animal of the Jersey breed. Twelve horses and colts were exhibited; among them were two good family horses. The show of poultry was not large or very attractive.

Of swine the Berkshire, Chester, and Essex breeds were represented. In the hall the fruit department was well represented. The display of apples was very large, and the quality remarkably good: the same may be said of the pears and grapes. The vegetable department did not contain that great variety of improved vegetables that one would expect to find in a country so well

adapted to their growth as Barnstable. In the butter and cheese department there appeared to be no entries. Of useful and fancy articles there was a very large display, showing, that, if the ladies of the county had not spent their time in making butter and cheese, they had not been idle; for many articles showed a great amount of labor and perseverance, as well as good taste.

About four hundred persons were present at the dinner, which passed off very pleasantly. The after-dinner speeches were made by Gov. Rice, Major Phinney, and others.

After dinner a rush was made for the track; but, as the State does not encourage the horse-trot, your delegate spent the remainder of the afternoon in viewing the articles on exhibition in the hall: so he is unable to state the appearance or the value of the winning horse.

In conclusion, your delegate would suggest, that, when county exhibitions are held in towns of limited capacities for entertaining strangers, lodgings for the delegate should be engaged in advance, and thus relieve the delegate from the unpleasant duty of travelling from house to house to find a place to rest his aching head and weary limbs, as was the case with your delegate to Barnstable.

EDMUND HERSEY.

NANTUCKET.

The Twenty-second Annual Exhibition of the Nantucket Agricultural Society was held on Wednesday and Thursday, the 5th and 6th of September.

The grounds of the society are about one mile from the town, containing about twenty acres of level land surrounded by a substantial fence, a fair half-mile track, stands for the committees and band, and a large number of stanchions and hitching-posts, where the cattle are all secured, and where the committees have a fine chance to view them. These were well filled with pure blood and grade animals, presenting for this section of the State a fine display.

The show of cattle was remarkably good. There were the Jerseys, Ayrshires, natives, and grades. I hardly expected, from what I saw of the soil of Nantucket, to see so large and fat cattle on exhibition. The show of sheep was good: a lot of twenty-one Southdowns and grades were fine specimens. The show of swine was not large, but of good quality. The show of poultry consisted of bronze turkeys, geese, ducks, pigeons, and hens of

the following varieties, — Light and Dark Bramahs, Plymouth Rocks, Games, Partridge, and White Cochins. At two o'clock the ploughing-match took place on the society's grounds. There were five contestants, and the work was all well done.

Following the above were several athletic games, for which various prizes had been offered by the society. They proved a source of entertainment to both old and young. The first on the list was the "running high jump," for which there were ten entries. R. Coffin jumped away with the first prize. He cleared the crossbar at four feet four inches; J. M. Folger, jun., four feet two inches; and W. Gardner, at four feet.

The second of the games was "putting the heavy stone." The stone weighed twenty-one pounds and a half. J. M. Folger, jun., "put it" twenty-five feet two inches; A. Chase, twenty-three feet four inches; and E. Young, twenty-two feet. The third game was the ball target game, in which there were twenty-six entries. Out of this number but three hit the target at all, and not one was fortunate enough to secure the prize. The attractions of the ground closed with the game; and the people slowly wended their way homeward to prepare to visit the hall or fair, where was to be seen one of the finest displays of vegetables, manufactures, &c., ever presented for inspection. The main hall presented a very attractive appearance in its dress of bunting, flags, &c., while the tables themselves were loaded down with pretty fineries. On the wall over the rostrum was the motto, "Glorious is the Work of the Husbandman;" on the east side, "Welcome to our Island Fair;" west side, "The Farmer's Crop is the Blessing of God;" south side, "Industry in Agriculture is the Twin-Brother to Thrift." Directly under the chandelier, in the centre of the hall, was a square table, on which was a pot of plants from a number of cultivators. On the square in the centre was a miniature building of a style of architecture altogether unknown to us, but certainly very pretty. The outside covering was of glass, and filled with a number of plants, making a very handsome centre-piece. The building was made by Capt. Manter of the Island Home. Thursday was devoted to the show of horses and colts. Quite a goodly number were entered in the several classes. The show of colts was very good. One owned by Charles F. Coffin was a superior animal.

Vegetables. — The show of vegetables was good, the root-crops in particular. There was a basket of Early Rose potatoes from a lot of three hundred and twenty bushels to the acre.

Of butter there were six entries; and the quality was excellent: indeed it was extremely difficult for the committee to decide where to make the awards.

Fruit.—The display in this department was good for the season.

Fine Arts.—The number of articles in this department was quite large, and the paintings of a high order of excellence.

Fancy Articles.—Many of the articles in this department were finely executed, and deserve more than a passing mention.

Manufactured Articles.—The manufactured articles were few in number, but seemed to be new. Mrs. R. G. Folger (seventy-seven years old, and totally blind) exhibited a box of knit hosiery. A large number of quilts of various styles and patterns adorned the sides of the hall, among which was one containing twenty-five hundred pieces.

A show-case of old coins, ancient crockery, brackets made from the olive-tree at Jerusalem, wax beads, and a shell,—the Lone Star of Texas,—were exhibited by Mrs. L. H. Wendal.

A very handsome miniature set of furniture, consisting of bedstead, bureau, washstand, table, two chairs, and a rocker, also a very handsome picture-stand, a carved comb-case, and one carved and worked worsted slipper-case, &c., attracted great attention.

The members of this society have reason to be greatly encouraged, when they remember the success of their last exhibition, in spite of drought and all other obstacles with which the farmer must contend.

The society seems to be in a thriving condition, and supported by many zealous and intelligent farmers; yet much of its success is due to the untiring efforts of its officers.

F. C. Knox.

MARTHA'S VINEYARD.

I attended the Nineteenth Exhibition of the Martha's Vineyard Society, Oct. 2 and 3.

The territory of this society is necessarily limited. Surrounded by the sea, you might expect the hall to be rich in trophies from this source, rather than rich with products of the land. The fact that it had so many and such fine products convinced me that the society had done, and was doing, a good work on that island.

I found some very good cattle in their pens. There were very few thoroughbreds; but some good grades and natives showed that the people here are not indifferent to the improvement of their stock.

Horses of all the classes usually shown were there, and, on the whole, of fair quality. The farms of the island afford good sheep

pastures. Some fine animals attest to care in breeding and good management. It was evident that the island not only affords good mutton, with its prized game flavor, but also tender lambs, that might gratify the palate of an epicure.

The swine were of fair quality and in good numbers.

The poultry of all kinds presented points of much interest, as worthy of study as those exhibitions representing very much larger territory. In such a region as this it evinced a care that indicates a rapid advance in this line of improvement.

The dairy products, though not large in quantity, presented butter of very marked excellence.

We were also surprised at the great variety of cereals. The plump clear kernels in almost every variety showed them unusually fine for the purposes of the table.

Turning to vegetables, the variety increased, and the quality and quantity were most marked; cabbages, pumpkins, melons, and roots, all seeming to vie with each other as to symmetry and size.

Fruits, both green and dried, of almost every name, looked toothsome and healthy. Pears, peaches, and grapes were good; but the apples seemed to have found an especial Eden on this island in which to grow this year. And, as I looked on the goodly display, I was disposed to think the salt air and the sea winds exercised some good influence on both vegetables and fruits.

The grand rally came in women's work of various kinds. The hall was well adorned by them with color, taste, and usefulness. The articles ranged from the most practical to the ornamental and decorative. Substantial bread, delicate cake, rich preserves, elaborate needle-work, and intricate meshes of worsted, spoke of both inventive brains and patient industry. An endeavor to gain a full conception of these mysteries served to convince me that the women were not only interested in the exhibition, but added to its power by a most painstaking diligence. In fact, it was very evident that the agricultural society promoted the best interests of home and social life. This is the evidence of its good work. It stimulates the farmers to improvements, draws all classes together, and in this way develops, in some measure, both mind and heart.

WILLIAM KNOWLTON.

FINANCES OF THE SOCIETIES.

SOCIETIES.	Amount received from the Commonwealth.	Income from permanent fund.	New members and donations.	All other sources.	Receipts for the year.	Premiums offered.	Premiums and gratuities paid.	Current expenses for the year, not including premiums & gratuities.	Disbursements for the year.	Indebtedness.	Value of real estate.	Value of personal property.	Permanent fund.
Massachusetts	-	$7,670 94	-	-	$7,670 94	-	$1,862 30	$445 10	$4,490 86	-	-	$77,302 47	$77,302 47
Essex	$600 00	1,742 08	$211 50	$1,405 26	3,958 84	$3,158 00	1,660 00	2,666 59	4,361 59	-	$8,000 00	1,000 00	21,215 08
Middlesex	600 00	-	109 00	2,603 71	3,312 71	1,665 00	920 50	1,099 18	4,120 73	$17,800 00	25,000 00	200 00	6,000 00
Middlesex South	600 00	-	84 00	2,731 81	3,415 81	1,288 25	640 25	2,775 56	3,415 81	11,000 00	18,000 00	-	7,000 00
Middlesex North	600 00	500 00	59 00	2,048 56	3,207 56	1,315 00	786 23	1,720 12	2,506 35	2,000 00	20,000 00	2,500 00	20,500 00
Worcester	600 00	-	30 00	3,104 29	3,734 29	1,600 00	1,359 00	1,717 65	3,076 65	41,000 00	100,000 00	1,000 00	50,000 00
Worcester West	600 00	-	59 00	2,011 77	2,670 77	1,835 25	1,615 24	1,417 95	3,029 19	3,393 92	12,500 00	600 00	9,706 08
Worcester North	480 00	-	850 61	1,522 24	2,852 85	1,047 25	836 20	1,656 65	2,492 85	11,670 00	16,000 00	539 16	4,600 00
Worcester No.-West	600 00	-	67 50	3,079 47	3,746 97	2,044 50	1,671 54	1,263 78	3,785 32	8,172 47	14,000 00	1,000 00	6,827 53
Worcester South	600 00	1,000 00	88 00	2,751 21	4,439 21	1,561 25	1,598 00	1,595 18	3,907 96	3,000 00	12,500 00	1,400 00	10,900 00
Worcester So.-East	600 00	-	76 00	3,102 82	3,778 82	1,366 00	834 26	2,850 91	3,685 17	9,939 66	14,000 00	1,000 00	5,060 34
Hampshire, Franklin, and Hampden	571 40	-	64 00	2,518 08	3,153 48	975 25	643 01	2,394 31	3,032 22	8,450 00	14,000 00	300 00	5,850 00
Hampshire	600 00	-	153 00	776 10	1,529 10	755 00	-	897 80	1,502 05	1,263 25	6,000 00	300 00	5,036 75
Highland	600 00	-	56 00	845 51	1,501 51	717 35	626 35	708 96	1,336 31	-	3,750 00	-	3,750 00
Hampden	600 00	-	20 00	3,024 09	3,644 09	1,572 00	541 57	3,066 45	3,608 02	24,850 00	35,000 00	-	10,150 00
Hampden East	600 00	-	57 00	538 86	1,195 86	1,035 75	846 64	433 14	1,279 78	181 35	5,000 00	-	5,000 00
Union	600 00	-	108 00	2,165 60	2,873 60	1,146 80	802 09	2,001 79	2,803 88	640 00	5,000 00	1,066 85	5,426 85
Franklin	600 00	119 78	153 50	2,727 64	3,590 92	1,969 75	1,556 00	2,034 92	3,570 73	2,000 00	10,000 00	1,600 00	9,600 00
Deerfield Valley	600 00	-	274 20	1,309 07	2,183 27	1,200 00	1,001 85	-	2,183 24	2,436 00	8,070 00	100 00	5,734 00
Berkshire	600 00	447 63	113 00	3,254 02	4,414 65	2,623 00	2,432 00	1,609 94	4,004 98	2,200 00	7,000 00	500 00	5,300 00
Hoosac Valley	600 00	-	489 00	3,008 79	3,497 79	2,274 00	1,871 00	1,403 17	3,274 17	5,798 70	12,500 00	625 00	7,321 30

Housatonic . .	600 00	-	271 34	4,063 00	4,934 34	2,930 00	2,731 25	2,083 73	4,516 06	-	8,000 00	500 00	8,000 00
Hingham . . .	600 00	-	172 95	2,326 19	3,099 14	1,358 25	710 65	1,538 88	3,351 63	4,500 00	34,600 00	4,600 00	30,100 00
Bristol . . .	600 00	-	181 00	8,271 45	9,052 45	4,542 72	3,957 25	4,770 98	8,728 23	12,500 00	50,000 00	500 00	37,500 00
Plymouth . . .	600 00	137 50	282 15	6,778 06	7,797 71	3,583 00	2,854 88	2,067 78	7,510 31	11,005 60	40,000 00	2,000 00	31,000 00
Marshfield . . .	600 00	-	126 80	1,581 94	2,308 74	1,356 00	965 00	1,768 34	2,733 34	5,136 21	11,806 92	1,372 98	8,043 69
Barnstable . . .	600 00	-	66 00	1,193 15	1,859 15	981 00	601 65	723 03	1,974 68	1,000 00	6,000 00	200 00	5,200 00
Nantucket . . .	573 00	22 50	39 40	367 74	1,002 64	996 00	613 35	401 98	1,015 33	-	2,800 00	254 87	3,054 87
Martha's Vineyard .	600 00	139 61	19 00	393 78	1,152 39	924 00	713 86	487 45	1,201 31	361 50	2,500 00	2,000 00	4,500 00
Totals . . .	$16,624 40	$11,780 04	$4,280 95	$69,604 20	$102,579 60	$47,820 37	$37,251 84	$47,611 32	$96,729 75	$189,798 66	$502,026 92	$92,461 33	$409,679 16

PERMANENT FUND—HOW INVESTED.

MASSACHUSETTS.—In bank stock, railroad stock and bonds, mortgages and mortgage bonds and policies in Massachusetts Hospital Life Insurance Company.

ESSEX.—In bank stock, railroad bonds, farm, cattle-pens, tent, and other fixtures.

MIDDLESEX.—In land and buildings.

MIDDLESEX SOUTH.—In grounds, buildings, &c.

MIDDLESEX NORTH.—In land and buildings.

WORCESTER.—In real estate.

WORCESTER WEST.—In real estate and fixtures.

WORCESTER NORTH.—In real estate, buildings, &c.

WORCESTER NORTH-WEST.—In grounds, track, buildings, fixtures, &c.

WORCESTER SOUTH.—In grounds, track, buildings, fixtures, &c.

WORCESTER SOUTH-EAST.—In grounds, track, buildings, fixtures, &c.

HAMPSHIRE, FRANKLIN, AND HAMPDEN.—In real estate and personal property.

HAMPSHIRE.—In real estate.

HIGHLAND.—In real estate.

HAMPDEN.—In land and buildings known as Hampden Park.

HAMPDEN EAST.—In fair grounds, buildings, &c.

UNION.—In park, barn, hall, &c.

FRANKLIN.—In grounds, buildings, fixtures, and bank stock.

DEERFIELD VALLEY.—In real estate.

BERKSHIRE.—In real estate.

HOOSAC VALLEY.—In real estate and personal property.

HOUSATONIC.—In real estate and personal property.

HINGHAM.—In hall and grounds.

BRISTOL.—In real estate.

PLYMOUTH.—In real estate, fixtures, furniture, &c.

MARSHFIELD.—In exhibition grounds and buildings.

BARNSTABLE.—In land and buildings.

NANTUCKET.—In fair grounds, building, fixtures, &c.

MARTHA'S VINEYARD.—In hall and fair grounds, and notes of members.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED.

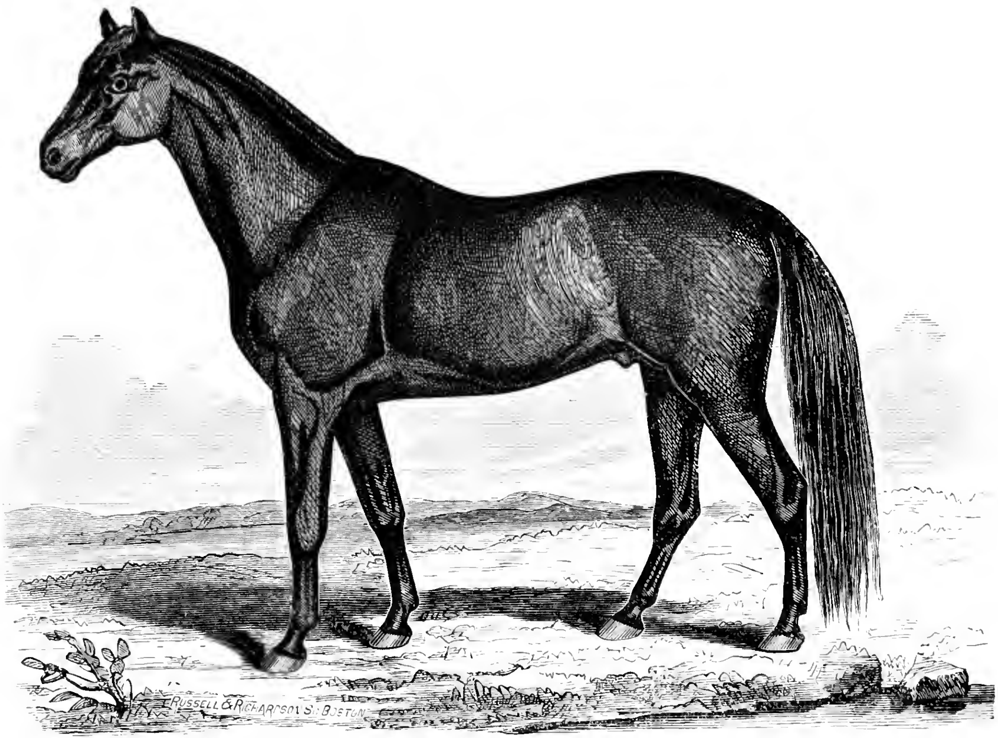
SOCIETIES.	Total am't offered for management and improvement of farms, orchards, &c.	Total am't paid for management and improvement of farms, orchards, &c.	For neat and dairy stock.	For horses.	For all other farm stock.	Total amount offered for live stock.	Total amount paid out for live stock.	For cereals and seeds.	For roots and vegetables.	Total amount offered for grain and root crops.	Total amount paid out for grain and root crops.	For fruits, flowers, &c.	For dairy products.	For bread, honey, and preserved fruits, &c.	Total amount paid out under the head of farm products.
Massachusetts .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Essex . . .	$350 00	$146 00	$480 00	$287 00	$133 00	$1,150 00	$875 00	$28 00	$181 50	$240 00	$168 00	$306 00	-	$18 50	$502 00
Middlesex . .	151 00	28 00	123 00	152 00	15 00	526 00	342 00	7 00	113 00	158 00	53 00	205 25	$12 00	43 00	254 75
Middlesex North,	55 00	45 00	129 00	121 00	75 00	756 00	386 25	18 00	89 00	95 00	61 00	189 00	16 00	60 00	362 98
Middlesex South,	77 50	77 50	119 00	90 00	135 00	494 50	260 50	14 75	73 25	261 25	71 55	52 25	9 00	26 00	169 50
Worcester . .	-	-	329 50	125 50	37 00	728 00	501 00	9 50	10 50	30 75	15 50	39 00	25 00	5 00	75 00
Worcester West .	112 00	82 00	414 00	37 00	399 00	1,527 00	1,403 00	-	22 50	52 00	18 50	69 25	42 00	12 00	98 75
Worcester North,	-	-	70 50	94 50	67 00	334 50	232 00	3 00	11 25	50 00	24 25	71 00	13 00	18 75	215 50
Worcester N.-W.	24 00	24 00	201 00	129 00	192 00	713 50	504 65	18 00	18 00	50 00	25 66	17 00	20 00	9 00	83 98
Worcester South,	135 00	-	210 00	592 00	59 75	1,151 50	961 75	16 25	11 50	66 50	30 00	53 00	18 00	22 25	151 00
Worcester S.-E. .	204 00	118 00	354 00	122 00	64 50	671 50	477 25	22 00	29 00	153 00	68 50	52 25	19 00	13 00	144 56
Hampshire, Franklin, and Hampden	23 00	3 00	221 00	170 00	144 75	616 00	481 00	5 50	16 50	120 00	23 00	80 50	13 00	13 50	122 50
Hampshire . .	-	-	103 00	110 00	155 50	448 50	368 50	4 50	21 20	53 00	48 00	72 00	20 00	21 75	160 75
Highland . .	70 00	69 00	155 25	129 00	102 50	438 25	386 75	1 00	10 00	-	-	18 75	10 50	11 90	52 15
Hampden . .	165 00	8 50	275 00	95 00	131 50	868 50	366 00	20 12	44 75	192 25	21 75	56 00	13 00	4 50	107 81

Hampden East .	173 00	23 00	245 00	114 00	107 00	538 00	412 00	16 75	23 00	122 00	32 25	56 05	18 00	16 75	137 15
Union . . .	22 00	10 75	197 50	311 25	150 75	856 25	602 04	27 50	38 75	86 50	65 25	12 10	22 75	15 75	120 85
Franklin . .	39 00	-	274 00	143 00	250 75	725 50	588 25	25 00	52 50	99 00	52 90	96 00	42 00	14 75	222 00
Deerfield Valley .	31 00	-	171 00	141 00	167 50	500 00	459 50	4 75	12 75	90 00	40 00	35 55	9 00	16 50	248 05
Berkshire . .	120 00	120 00	335 00	805 00	264 00	1,404 00	1,404 00	203 00	135 00	338 00	338 00	88 00	41 00	48 00	512 00
Hoosac Valley .	62 00	41 00	94 00	148 00	222 50	678 00	464 50	132 00	103 50	122 00	109 00	89 25	55 00	50 00	429 75
Housatonic . .	153 00	143 00	375 00	221 00	374 75	1,078 50	970 75	298 00	123 50	422 00	421 00	147 00	80 00	46 00	737 50
Hingham . .	80 00	6 50	173 00	45 00	119 75	615 25	337 75	3 00	63 00	97 00	35 50	102 10	13 00	22 30	203 40
Bristol . . .	449 00	175 00	680 00	267 00	311 00	1,342 00	1,154 00	100 00	128 25	538 00	168 25	183 50	39 00	31 75	274 25
Plymouth . .	300 00	89 00	518 56	177 00	251 92	1,001 00	947 48	80 00	101 25	184 00	181 25	166 00	58 00	36 25	441 50
Marshfield . .	105 00	57 00	198 00	82 50	96 25	506 50	376 75	51 00	85 00	210 00	136 00	89 50	28 00	41 75	295 25
Barnstable . .	134 00	42 00	101 00	43 00	85 00	287 00	229 00	10 00	40 75	197 00	50 75	84 65	-	28 00	163 40
Nantucket . .	128 00	32 00	192 50	51 00	67 50	542 00	311 00	25 00	45 50	147 00	31 00	21 25	12 00	10 00	213 75
Martha's Viney'd	38 00	25 25	132 50	57 00	106 25	430 35	275 75	69 50	65 16	178 00	97 91	56 80	19 25	45 00	121 05
Totals . .	$3,200 50	$1,336 50	$6,831 31	$4,859 25	$4,286 42	$20,928 10	$16,080 42	$1,213 12	$1,769 86	$4,352 25	$1,986 87	$2,509 00	$667 40	$701 95	$6,621 13

Analysis of Premiums and Gratuities Awarded. — *Concluded.*

MISCELLANEOUS.

SOCIETIES.	For agricultural implements.	Offered for raising forest-trees.	For experiments on manures.	Amount awarded for objects strictly agricultural, not already specified.	Amount awarded and paid out for trotting horses.	For objects not strictly agricultural: domestic manufactures, &c.	Number of persons who received premiums and gratuities.
Massachusetts . .	-	-	-	$4,490 86	-	-	-
Essex	-	$30 00	$25 00	213 00	-	-	-
Middlesex . . .	$31 00	50 00	-	-	$560 00	$130 00	171
Middlesex North . .	9 00	-	-	-	-	45 00	203
Middlesex South . .	4 00	60 00	-	-	310 00	86 75	122
Worcester . . .	-	11 00	-	-	625 00	12 50	154
Worcester West . .	20 00	30 00	19 00	-	573 00	52 30	216
Worcester North . .	-	25 00	-	-	271 00	76 70	198
Worcester North-West	12 00	30 00	-	-	640 00	422 50	235
Worcester South . .	4 50	35 00	-	-	440 00	15 25	171
Worcester South-East .	14 00	30 00	-	-	415 00	114 45	280
Hampshire, Franklin, and Hampden,	28 00	20 00	-	-	755 00	50 00	178
Hampshire . . .	-	-	-	-	320 00	-	171
Highland . . .	4 75	-	-	9 00	30 00	84 70	232
Hampden . . .	30 00	30 00	15 00	-	-	56 25	74
Hampden East . .	9 25	25 00	13 00	14 00	200 00	33 74	137
Union	1 00	-	-	47 45	175 00	20 00	167
Franklin . . .	-	10 00	5 00	26 00	620 00	96 75	280
Deerfield Valley . .	6 25	-	-	-	315 00	91 30	300
Berkshire . . .	18 00	-	-	-	-	375 00	561
Hoosac Valley . .	18 00	-	12 00	22 50	645 00	250 25	319
Housatonic . . .	25 00	-	-	-	475 00	378 00	750
Hingham . . .	-	50 00	-	39 00	-	124 00	292
Bristol	40 00	30 00	60 00	43 50	1,705 00	306 97	713
Plymouth . . .	7 50	60 00	-	-	890 00	479 42	596
Marshfield . . .	-	50 00	-	-	53 00	195 40	907
Barnstable . . .	2 00	7 00	12 00	-	65 00	100 25	393
Nantucket . . .	-	21 00	16 00	-	-	113 60	197
Martha's Vineyard .	-	11 00	-	-	21 00	91 30	489
Totals . . .	$284 25	$615 00	$177 00	$4,905 31	$10,103 00	$3,808 38	8,506



"HERALD," formerly "GRAPHIC." Bred and owned by W. T COOK, Foxborough, Mass. See Preface to Ft. 2.

ABSTRACT OF RETURNS

OF THE

AGRICULTURAL SOCIETIES

OF

MASSACHUSETTS.

1877.

EDITED BY

CHARLES L. FLINT,

SECRETARY OF THE STATE BOARD OF AGRICULTURE.

BOSTON:

Rand, Avery, & Co., Printers to the Commonwealth,

117 Franklin Street.

1878.

PREFACE.

THE distinguishing feature of this Report is the complete general index of the whole Second Series from 1853 to 1877 inclusive. It will add very much to the value of all the Reports. A book without an index is very much like a spade without a handle. If a book is worth any thing, it is worth vastly more when it is provided with the means of finding what it contains; and the same is true of any series of books. The twenty-five Reports contain a vast number of thoroughly first-class scientific and practical papers and discussions, covering a wide range of topics relating to almost every department of farm industry. They constitute something of a farmer's library of themselves; and the index was regarded as an essential requisite to their completeness.

I am indebted to Col. Wilder for the admirable steel plate which forms the frontispiece of the Report, and to Capt. John B. Moore for the plate illustrating his new seedling grape, also to Mr. Cook of Foxborough for the striking likeness of his horse "Herald," formerly known as "Graphic." He was sired by Smuggler, dam, Cook's Kitty Clyde. This remarkable colt was bred by W. T. Cook, Esq., of Foxborough, Mass., and was foaled Aug. 12, 1874. When only three weeks old, he was shown at the New-England Fair held in Rhode Island, where he received the first premium of the society for horse colts over a field of nineteen entries; his extraordinary limbs and muscular development attracting marked attention from breeders and horsemen even at that early age.

In 1875 he was exhibited at the same fair, held in New Hampshire, where the first premium was again awarded him over a field of twenty-two entries, among which were some of the finest yearlings ever shown in New England. In 1876, at the Centennial Horse Exhibition held in Philadelphia, the highest honors in the two-year-old class for trotting stallions were awarded to him. He is a very rapid walker; and his action in trotting is clean, free, and level, showing evidence of great speed. That he will make a successful sire is evident from the fact that he has already shown himself possessed of the power of endowing his get with his own wonderful development of both limbs and muscle. His pedigree is as follows: --

PEDIGREE OF "HERALD," FORMERLY "GRAPHIC."

(Very Rich Dark Brown. Small star, and white heel on near hind leg. Stands 16 hands and ½ inch high. Weighs 1140. Foaled Aug. 12, 1874.)

- **SMUGGLER.**
  - Blanco.
    - Irons' Cadmus.
      - Cadmus.
        - American Eclipse.
          - *Duroc.*
            - Im. *Diomed.*
            - Amanda.
          - Miller's Damsel
            - Messenger 1562.
            - Pot 8 os mare.
        - Die Vernon,
          - Florizel 940
            - Im. *Diomed.*
            - Daughter of
              - Shark.
                - Marske.
              - Daughter of
                - Eclipse, son of Im.
                - Fearnaught.
          - Daughter of
            - Oscar 1752.
              - Im. Gabriel.
              - Vixen, by Im. Medley.
            - Daughter of
              - Union.
                - Im. Sprightly.
                - Harmony, by Im. Figure.
    - Daughter of
      - Irwin's Tuckahoe.
      - Daughter of
        - Jones' Oscar,
          - Oscar 1752.
            - Im. Gabriel.
            - Vixen
              - Im. Medley.
  - Dam by Herod's Tuckahoe. 2d Dam by Im. Tom. ?
- **KITTY CLYDE.**
  - Snap Dragon, bred by Francis Daniels, Grafton, Vt.
    - Jimmy Rattler.
      - Biggott's Rattler,
        - Sir Henry.
          - Garrett Horse.
            - *Im. Leonidas.*
          - Dam
            - *Hambletonian* 1097½
              - Messenger 1562.
              - Dam by Messenger.
        - Dam by the Hyde Horse.
          - Andrew's Hambletonian, sire of *Princess*
            - Judson's Hambletonian.
              - *Hambletonian* 1097½.
                - Messenger 1562.
                - Dam by Mes'ger.
          - Dam a highly bred mare, brought from Sandy Hook.
      - Dam by Engineer 2d, (sire of Lady Suffolk) a grandson of Messenger 1562.
    - Plainfield Mare bred by B. C. Daniels, Plainfield, N. H.
      - Pike Horse
        - Whalebone, or Clark Horse, by Sherman, son of Justin Morgan.
      - Kate.
        - Parran Stevens' Horse.
        - Whiteface, bred by Capt. Westgale, Plainfield, N. H.
  - Rail Road, bred by Steph. Wood, Ludlow, Vt.
    - Whitcomb Horse, bred by Thos. Whitcomb, Ludlow, Vt.
      - Johnson Horse, bred by Marvell Johnson, Mt. Holly, Vt.
        - Woodbury, son of Justin Morgan.
        - Dam, a Hambletonian mare, bred by Mr. Johnson, Mt. Holly, Vt.
          - *Hambletonian* 1097½.
            - Messenger 1562.
            - Dam by Messenger.
      - Dolly, bred by Thos. Whitcomb, Ludlow Vt.
        - Cock of the Rock
          - *Duroc.*
            - Im. Diomed.
              - Grey Diomed.
                - Partner.
                - Kitty Fisher.
              - Dam.
                - Cade.
            - Amanda.
          - *Romp.*
            - Messenger 1562.
            - Pot 8 os mare.
              - Pot 8 os.
              - Dam.
                - Gimcrack.
                - Dam.
                  - Cullen Arabian.
        - Dam, a chesnut mare, (highly bred) im. from Canada by Abel Haile, Ludlow, Vt.
    - A Grey Hambletonian mare, bred by Mr. Lincoln, of Shrewsbury, Vt.
      - Harris' Hambletonian.
        - *Hambletonian* 1097½.
          - Messenger 1562.
          - Dam by Messenger.
        - Dam, imported by Mr. Munson, of Boston.
      - Dam not traced.

The introduction of the General Index has necessitated the condensation of the Abstract to a somewhat greater extent than usual; but it will be found to contain the cream of the Transactions as returned by the county societies. I must call attention to the meagreness of the returns from many societies, and suggest that strenuous efforts be made by the officers to obtain more elaborate, instructive, and valuable reports from the several committees having the different departments in charge. The efficiency of a society is very properly judged by its record. If this is bald, and destitute of life and interest, it is certain that there is a radical fault in the management, which ought to be sought out and corrected.

In the analysis (1) of the Fine Bones of Messrs. L. B. Darling & Co., on p. 323 of the Report, 22.03 per cent of phosphoric acid should have been credited, that constituent having been inadvertently omitted in transcribing.

CHARLES L. FLINT.

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AGRICULTURE OF MASSACHUSETTS.

ELEMENTS OF SUCCESS ON THE FARM.

[From an Address before the Essex Society.]

BY OLIVER S. BUTLER.

MEN fail of success because they have failed to find the proper orbit in which God intended they should move, and on this pivot turns the failure or the success in farming. The principal factor in this difficult problem is the man. The successful farmer is one who chooses his vocation for the love of it, and comes to it with just and proper conceptions of its nature and duties, and, in pursuing it, is not disappointed.

If a man really hates or detests his business, and pursues it from necessity, he ought not to expect to succeed; and his failure ought not to be attributed to the nature of his business, but to the nature of the *man*. He must not only come to his calling with a love for it, but with just and proper conceptions of its nature and duties. If a man enters upon any business with wrong conceptions, or improper notions in regard to its nature or the duties required, he will be sure to fail of success. First he will be disappointed, and then comes discontent, and then defeat and failure; and many a farmer has failed of success in his chosen calling from this very cause. I have known many young men, who having read our agricultural literature, or perhaps listened to the after-dinner speeches at our fairs, have come to entertain a sort of rose-colored view of agriculture, and, having chosen farming for their business, have been undeceived when it

was too late to retrieve their steps. Perhaps they did not really think that the corn would grow without planting; or that the cows would come up into the parlor, and ask to be milked; or that the hens would lay three eggs a day in the dairymaid's lap: but then they had no adequate conceptions of the skill required, and the labor to be performed, in order to force from the reluctant soil the richest treasures, and to wring from apparent defeat the assured success for which they have toiled.

The successful farmer, then, is one that brings to his calling an ardent love for the same, and the most just conception of its nature and its duties. And he must also possess a sound, healthy physical system: we regard this qualification as indispensable. While we freely admit that the invalid may regain his health by gentle, moderate exercise among the healthful scenes of farm-life; and that the imbecile may not starve on the farm so long as his inherited acres remain to him; and that the gentleman farmer may do much to improve his lands and his stock, as well as for the development of new methods of culture, in which all his brethren may share, without putting his own hands to the plough or the hoe; and that it shows both goodness of heart and wisdom of mind, when the aged and the infirm retire among the scenes and the associations of their youth to spend the evening of their days in peace and the happy reflections that come from a well-spent life: still we must insist that the man who must expose himself to the elements, and brave the storms of winter, and bear the heat of summer; the man who must guide his plough with his own hands, and pitch his new-mown hay over the great beams without a patent fork; the man who must build his own walls, and ditch his own meadows, — will need to have a strong, healthy body, well developed, well trained, and under perfect control. He needs, and must have, a physical system that does not need any of your bitter drugs to give a relish for its food, or a cathartic to work it off, or powerful opiates to bring sleep to his eyelids. The successful farmer not only needs a healthy, vigorous body, but a sound, well-balanced mind, with the broadest culture. Away, forever away, with the notion that any ignoramus will do well enough for a farmer, or that farming is to be prosecuted simply by main strength and

stupidness. Oh, no! Such is the nature of your calling, that it requires the broadest culture and the most varied acquirements.

In almost every other vocation the man of one idea may succeed, but not so with farming. Why, think for a moment of the elements, the forces, the properties, the influences, the laws, developed and undeveloped, that he must come in contact with, and understand, if he would succeed. Take the young farmer out on to his broad acres, and let him look beneath his feet, and contemplate the soil out of which he is to draw his treasures, and ask him to make that his study, until he understands its component parts, its marvellous mysteries, its various needs and adaptation to the different crops he may wish to cultivate; and how long would it take him? Then let him attempt to enumerate and analyze and annihilate, if he can, all the countless horde of insects and vermin and reptiles, with their modes of life and propagation, that lie in ambush, waiting to devour the precious seed as soon as it falls from his open hand; then let him attempt to analyze the influence of light and heat, of wet and dry, upon his varied crops; then let him look into his barnyard or stalls, and watch his growing herds; let him attempt to become familiar with the different breeds of cattle, the best adapted to his climate and business, with the best methods of treatment, and feeding that will give him the best results; then let him look above into the heavens overhead, — and what mysteries meet his gaze, and invite his investigation, from the shifting clouds, the varying winds, and the mellow sunset-tints, to the storms and tornadoes that devastate his fields, and blast his hopes! How endless the variety of subjects that meet him on every side, and challenge his investigation! The successful farmer an ignoramus! impossible, impossible!

But in order to the most varied and thorough cultivation of the man, or the successful investigation of these varied subjects, he must become familiar with the agricultural literature of his times, and, if possible, of all times; for a farmer without an agricultural library would be like a hoe without a handle, or a rake without a tooth. But the successful farmer must be more than a reader of books; he must do more than take the products of other minds and

experiments, and use them without knowing why: he must be a thoughtful man, a progressive man. Now, the difference between the automatic reader of books and the thoughtful man is as wide as from the centre to the poles. The unthinking man is like the bucket that goes to the well to be filled with water, or the sack that goes to the mill to be filled with grain. The water that fills the bucket, or the grain that fills the sack, cannot do either vessel any good: it may do them much harm by over-filling, or filling beyond their capacity. *This filling process is all too common.* There are too many empty buckets and sacks on our farms to-day; and they are found everywhere, even in our churches and lecture-rooms, — empty heads waiting to be filled.

The thoughtful man is altogether a different person. He finds a subject for his thoughts, and a lesson for his learning, in every thing around him. The thoughtful farmer never takes the tiny seed into his hand, without studying the law of germination, of development, and death. He never takes hold of the handles of his plough, without studying the form and structure of the machine, and how it might be improved so as to leave his furrow straight and smooth; and, if he is very thoughtful, he goes down below the furrow of his plough, and studies geology and mechanism at the same time. He not only looks into books, and reads them well; but he makes books for others to read. He not only consults authors, and compares their different theories; but he becomes an author himself, and constructs theories for others to follow. He not only reads history; but he makes history. He not only familiarizes himself with the deductions of science; but he develops and elaborates and utilizes science, and makes it contribute to his success as a farmer.

Another necessary element of success in the character of the farmer is a well-balanced and well-developed moral nature. For no man can be truly honest who has not a well-developed moral nature; and honesty or integrity of character is the basis of all greatness or goodness in any individual. But such is the condition of the farmer's life, and such is the nature of the elements and properties with which he constantly comes in contact, that all tricks, all deceptions, all sham and duplicity, should be forever banished from the farm. This is all the more needful for the

farmer in order to strengthen his faith and confidence in the God of the seasons, against the time of trial. There comes to every man and every family a time of trial and disappointment, when the mind is bewildered, and the heart grows faint, and hope dies out, and comes not back with the morning light. But there are trials and disappointments that are peculiar to the tiller of the soil. For after he has selected the seed with the greatest care, and planted it in the most congenial soil, and cultivated the growing crops with the greatest care and persistency; and when every indication would seem to warrant a large and even bountiful harvest, and he begins to count his gains as sure, — then comes the drought of summer, and he waits for the coming rain; but it comes not. The earth is parched and dry beneath his feet. The heavens above him are red with their brazen heat, and the disheartened farmer must look on his withering and wasting crops, as helpless as the shipwrecked mariner floating on at the mercy of the great deep sea; for to make an effort of resistance is to cope with the infinite forces of nature.

But suppose a remnant of what gave so much promise a short time since is left him, and he begins to hope that something, after all, will be left him; then come the swarming insects, and the countless hordes of vermin that crawl at his feet, or fly in the air; and, after these have taken their share of the precious fruits, there is but little left for the early frost, that leaves our cornfields as black and as barren as the plains of the Nile when the overflowing tides refuse to come. But suppose this picture to be a little overdrawn. Suppose the harvest redeems the promise of the spring-time and the summer, and the root-crops groan and grow, and the corn-fields laugh in the sunlight, and the trees are loaded with their golden fruit, the granaries are full, the barns can hold no more, the storehouses burst forth with their rich treasures; then he is told that the markets are full, and that there is no sale for his products at a remunerative price, and he knows not whether to pray to be delivered from his friends or his enemies. Now the farmer, standing in the presence of such defeat, and sometimes disaster, as this, needs a well-cultivated moral nature, that will produce in him a faith and confidence in God, the Creator and the Ruler of this uni-

verse, to whose infinite mind all these mysteries of nature are as apparent as the daylight, and under whose control all the elements move in their order, and who has sworn by himself that seed-time and harvest, summer and winter, shall not fail. With such a sublime faith as this in the God of the universe, the husbandman goes forth to his labor again in the returning spring-time. He sows in faith, he cultivates in faith, and gathers in the precious fruits of his toil with rejoicing. Then let every man be true.

"To thine own self be true,
And it must follow as the night the day,
Thou canst not then be false to any man."

And now, Mr. President, if the question should be asked you, Does farming pay? or is farming as profitable as other business? then give the same answer you would with reference to any other business or profession (for it is just as pertinent to any other business as to this), and if the question should come, answer it by saying, "Yes, when the right man is found in the right place." Farming is a failure only when the wrong man is in the right man's place; and it is more truly the case with reference to farming than it is to any other branch of business.

Hence it must be seen, that in order to the most successful cultivation of the soil, the breeding and developing of cattle, and bringing them to a profitable market, the right man must be found in the right place.

Then we come back to our first statement, that the man is more than his accidents, even in farming; and although

"It may not be our lot to wield
The sickle in the ripened field,
Nor ours to hear on summer eves
The reaper's song among the sheaves;
Yet when our duty's task is wrought
In unison with God's great thought,
The past and future blend in one,
And whatsoe'er is willed is done."

THE OLD AND THE NEW.

[From an Address before the Union Society.]

BY WASHINGTON GLADDEN.

Between the agriculture of the Revolutionary period and the agriculture of to-day, the difference was less marked, of course, than that in the methods of communication; for agriculture is the oldest of the arts, and many of its methods admit of little improvement. Still, if the farmer of that period were to revisit the glimpses of the moon, he would see some sights that would cause him to open his eyes wide. He would not find many new kinds of staples growing on our farms; for I believe, that, of those agricultural products reported as staples in the last census, all but one, sorghum, was cultivated in this country a hundred years ago. Some of the things that are staples now were not, however, staples then; cotton, for example, which was raised, to some trifling extent, in gardens, even here in New England, but which, on account of the cost of preparing it for market by hand-labor, was not a profitable crop. It was the invention of the cotton-gin in 1793, ten years after the close of the war, that led Cotton forth from his nook in the corner of the kitchen-garden, and crowned him king. The story of this cotton-plant is one of the surprises of the century. It was cotton that perpetuated slavery, by furnishing a great commercial staple that could be raised and prepared for market by ignorant and imbruted labor. It was cotton, that, by wasting the land on which it was planted year by year, made an extension of slave territory necessary to the existence of the slave system. And thus it was the edict of King Cotton that the North was roused to resist, when the cry of "No more slave States!" was heard. That was the cry that sent Abraham Lincoln to the

White House, that precipitated the Rebellion, that shook the land with the thunders of civil war. Some hard things are said about King George in the immortal Declaration; but this land has suffered tenfold more from the tyranny of King Cotton than it ever suffered from the tyranny of King George.

Most of the farmers of 1776 made their own tools; and, of course, they were clumsy and imperfect enough. Many new ones have been invented: all the old ones have been greatly improved. The plough that was left in the furrow by those "embattled farmers" who "fired the shot heard round the world," was a very wooden thing indeed: it could not have cost them much of a pang to leave it in the furrow. The point only was iron; the mould-board was wood, sometimes plated a little with sheet-iron; the standard rose almost vertically from the beam, and was held by two pegs driven into it; and the ploughman who followed such a machine all day must have been a tired man at nightfall.

Drilling-machines for planting certain crops were used by very few farmers a hundred years ago; but the cultivators, the pulverizers, the crushers, the horse-hoes, the horse-rakes, the horse-forks, and the tedders of to-day, were wholly unknown. Fanning-mills were in use; but much of the grain was still cleaned by the hand fan. The only threshing-machines known to the colonists were the flail, the wooden roller, and the horse's hoof. A man could thresh with a flail from eight to twelve bushels a day: with almost any modern thresher, properly attended, a hundred bushels per man per day is a moderate result.

The instruments for cutting grain and grass were the sickle and the scythe: even grain-cradles were unknown at the beginning of the century. Of course the reaping and mowing machines had never been thought of. The part that this invention has played in our national drama is one of no little interest. If it had not been for the reaper, the late war might have had a very different issue. By the aid of this wonderful machine, the farmers were able to gather their harvests with very few hands, and thus the young men of the country were released for service in the army. If it had not been for the reaper, hundreds of thousands of the men who went to the front would have been obliged to stay at

home to harvest the crops on which the army, and the nation, and the world, were fed. It is estimated by one authority. that the reaping-machines scattered throughout the country at the beginning of 1861 performed labor in harvest equal to that of a million men with hand implements.

One very remarkable circumstance that closely connects the reaping-machine with the destiny of the nation came to my knowledge not long ago. The fact is one that I have not seen in print, and I doubt whether it is generally known.

Just before the war, Mr. McCormick, one of the principal manufacturers of reaping-machines, brought suit against some of the other inventors for infringement of his patent. The case was tried at Cincinnati, I think; several of the rival manufacturers combining to resist Mr. McCormick's claim. If his suit had been successful, he would have had a practical monopoly of the business, and the machines would have been kept at a very high price. It was the interest not only of the other manufacturers, but of the farmers, and of the country at large, that this monopoly should not be permitted, unless the law clearly authorized it. The two principal lawyers employed by the defence were men who were then but little known: their names were Abraham Lincoln and Edwin M. Stanton. They had never met before; but during this trial, in which they were successful, they formed a friendship which led, no doubt, to the appointment, in 1862, of Mr. Stanton as secretary of war. Thus this lawsuit about a reaper not only broke a monopoly, and supplied the Western farmers, just before the war, with these machines at lower prices; but it also brought together the President who proclaimed emancipation, and the great war minister who organized victory for the armies of the North. Of coincidences like this does Providence forge the links that make up the chain of history.

Into the record of material progress it is hardly necessary to go any farther. Conceive, if you can, the life of a people to whom so many of those things which to us are the commonest necessaries of existence were unknown. A hundred years ago there were no stoves, no furnaces, no friction-matches (fires were struck with flint and tinder), no steel or gold pens, no rubber over-shoes, no rubber goods of any description, no silver forks, no daguerrotypes, no photographs,

no street-cars, no railroads, no locomotives (perhaps in all the country two stationary engines), no steamboats, no iron-clad ships, no breech-loading guns, no iron safes, no circular, band, or jig saws, no telegraph, no illuminating-gas, no kerosene, no balloons, no elevators, no stereotype-plates (in this country at least), no paper-making machinery (paper was all made by hand), no lithographs (the age of chromo civilization was not yet), no power-presses, no daily paper, no sewing-machines, knitting-machines, pegging-machines, washing-machines, wringing-machines, milking-machines, churning-machines, no bean-shellers, cherry-stoners, raisin-seeders, butter-workers, sausage-grinders, corn-poppers, cream-freezers, dish-washers, egg-boilers, carpet-stretchers, knife-sharpeners, lemon-squeezers, chicken-hatchers, baby-jumpers. Vaccination was unknown. Ether and chloroform as anæsthetics had never been heard of. Gentlemen wore no silk hats, — beavers instead, — and no pantaloons, only knee-breeches and stockings; and there was no need of Old Probabilities to tell when to carry umbrellas, because there were no umbrellas to carry. We may be inclined to pity the people who lived at a time when all these things were unknown; but if we reflect that in those days the lightning-rod man and the life-insurance agent had not made their appearance, that the voice of the organ-grinder was not heard in the land, that the ballot-stuffer and the bull-dozer were yet unknown to fame, and that there were few, if any, tramps, and no book-agents, we shall see that the advantage is by no means all on our side.

The diversions of the people were not numerous. In the rural districts there were husking-bees, and paring-bees, and quilting-bees; and every "raising" was turned into a festival. The heavy timber of the old houses and barns made it necessary to have a large force of men on hand to raise the "bents," after they were framed together; and, inasmuch as nothing of this kind could be done without an ample supply of the distilled extract of molasses, the building was not usually the only thing raised at the "raising."

It would be a pleasant diversion, if we had the time for it, to turn now from the past to the future, — to bid the Muse of history be silent, and invoke the Spirit of prophecy. Especially would we like to look out along the track which our agricultural industries are to follow through the coming

years, to guess what the rank of the farmer will be in the next century, and to predict the changes that will take place in his relation to our industrial and social life.

I cannot but believe that these changes will have the effect to elevate the farmer, to raise his rank in our industrial hierarchy. During the last twenty-five years the tendency has been away from the farms, and toward the towns. The great improvements in machinery and in the facilities of communication, the specialization of industries, and the organization of trade and manufactures, have afforded opportunities for rapid gains; and the farmers' boys, who looked from afar upon the glittering prizes that the people in the towns were winning, have been inflamed with the ambition to have a share in this boundless gain. So it has come about that our cities have grown much faster than was wholesome for them or for the country. But we are beginning now to find out that the Fortune that dwells in towns, and that presides over trade and manufactures, is a freakish goddess, and that the favors which at one moment she lavishly bestows, in the next moment she heartlessly snatches away. Of those people in our cities, who, four or five years ago, thought themselves well to do, a large proportion are now penniless; and with many of them the question of food is becoming a very serious question. Thousands of them have unburdened themselves of heavy obligations by means of the bankrupt law; and there are not a few, who, with consciences too scrupulous to seek relief in this way, are still laden, and will be laden for many years, with a terrible load of debt which the shrinkage of values has let down upon them. And while there is good reason now to hope that we have come to the turning of the tide in our business, that the period of depreciation and disaster is about closing, and that we shall see an improvement from this day in trade and in our manufacturing interests, yet this improvement will be slow; the profits of business will be small; and only those will be able to sustain themselves, who know how to work on the narrowest margins, and to practise the most rigid economy. Even though trade should be moderately good in the future, a large slice of the profits will be consumed by taxes. The cities and large towns are nearly all burdened with enormous debts; and they have got in the habit of making large appropriations

for current expenditures. It is not an easy task to cut down the expenses of a city: too many people who vote, and do not pay taxes, are interested in keeping them up. Even, therefore, if no attempt be made to reduce the debt, the interest account and the current expense account, to be annually provided for by taxation, will be sufficiently large to add greatly in all our cities to the embarrassments of business. Under these circumstances I do not expect to see the population of the cities growing in the next few years, as it has been growing now for several years, at the expense of the farming-districts. Some cities and large towns will continue to grow rapidly, no doubt; but many will stop growing, and some will suffer a decrease of their population. Neither are the manufacturing villages likely to grow. The manufacturing facilities are now largely in excess of the public needs; and many that have been employed in this kind of labor will be obliged to return to the farms.

I expect, therefore, to see the business of farming rising in the popular favor, to see the currents of population tending, in many cases, away from the cities, and toward the farms, to see the people that now till the land more contented than they have been with their calling, and more determined to excel in it, to put their brains and their hearts into it, and to make the farmer's life not only a life of plenty, but a life of culture and of beauty. Your greatly improved machinery and methods relieve you of much of the drudgery that was inevitable when I was a farmer's boy; and your recent complaint of the lack of help — which, you say, explains the fact that so many acres have been lost to cultivation on these hills — will not be heard so frequently in the near future; for there are thousands of people in the large towns who will be glad to work for you for reasonable wages, after they have starved a little while longer. I wish that you would put yourselves in communication with our Union Relief Association in Springfield, and let us see if we cannot work together in such a way as to furnish you with the help you need, and some of our suffering poor with labor and a livelihood.

With these improved facilities, and this better supply of labor, we may not only look to see many of the farms of New England, that have long been running to brakes and huckle-

berry-bushes, again subdued, and brought under tillage, and the once fruitful fields that are now wildernesses again rejoicing, and blossoming as the rose; but we may also hope, that with his increased prosperity, and his added leisure, and the strengthened sense of the dignity of his vocation, some improvement will also take place in the social life of the farmer. Many things can be done to make the farm-life brighter and more attractive. Mr. Waring thinks that the farmers of any given district might group their homes in villages, — not living upon their farms, but going back and forth between the farm and the home daily, and that the loss of time in travelling would be more than made up by the gain of being near to school and church and lecture-hall, and having such greatly improved opportunities of social enjoyment and culture. I am not at all sure that this plan would work in all neighborhoods; especially would it be difficult to realize in such a town as Blandford, where the distances are so long, and the hills so steep. But the thing is worth thinking of; and the suggestion of a more perfectly developed social life, of more frequent assemblies for social purposes, to be held in the leisure season, — assemblies in which innocent diversion shall be combined with mental improvement, — is a suggestion that I know the farmers of Blandford are ready to heed. The evidence that they are awake to the importance of cultivating the social element, and believe not only in getting a living, but in taking the good of life as they go along, I have seen while I have been among them.

And such signs as these are full of promise. When farm-life is relieved in part of its lonesomeness, and when its lack of opportunities for mental quickening shall be supplied, many of our brightest boys and girls, that are now inclined to run away from the farms to the towns, will be held fast to the soil; and some of that mental energy, which in the last half-century has gone into the development of our mechanical and commercial and manufacturing industries, will be expended upon the improvement of our agriculture.

TREATMENT OF FARM-STOCK.

[From an Address before the Housatonic Agricultural Society.]

BY HENRY BERGH.

It is an undeniable fact, which, doubtless, each one of you recognizes, that domestic animals are the indispensable population of the farm, and form its principal riches. Without these creatures, agriculture would be impossible. It follows, therefore, that it is the duty and policy of agricultural societies to impress upon the minds of cultivators of the soil the necessity of employing the best means in their power for the improvement of their stock, their care, and their humane and intelligent utilization. Every living creature has assigned to it a limit of endurance and power; and whoever attempts to exceed it commits a blunder and a sin which is certain to avenge itself, at a cost vastly disproportionate to the advantage contemplated. There is a perfectly natural accord between this admirable society of yours, gentlemen, and the one which I have the honor to represent. You seek to make the world profit by the labors of the toiling animal; we, to protect and preserve its powers from that cruel deterioration consequent on unreasonable treatment.

That agriculture may reap full benefit of the labor of brutes, it is essential to estimate carefully the distance to be travelled, the weight to be carried, and the number of hours in the day, and the days in the week, to which their strength may be profitably applied. There is a universal law affecting the material interests of living and inanimate things, and that is, economy. Transgress this law in any of its relations to this world's affairs, and it speedily avenges itself by wasted physical power, deterioration of the elements of production, sterility, and death. It is a stupid delusion to

suppose that any of the laws of the Creator of all things can be subverted or disobeyd by mankind with impunity. You may over-work, over-drive, over-load, your patient and submissive animal; but you abstract so much wealth from your possession by so doing. The laws of vital economy are aptly illustrated by a little story which I remember to have read somewhere, in substance as follows: A youth and an old man started off together on a long journey; the former on a jet-black fiery charger, the latter on a quiet, undemonstrative gray nag. At the start the black steed was soon out of sight; and, ere a quarter of the journey was performed by the steady old gray, already had the youth put half the road behind him. Thus they journeyed on, until at length the old man, on looking up, thought he discerned in the distance a dark, moving spot, which suggested to his mind the possibility that his young friend, having met with some accident, had been compelled to moderate his speed. As he progressed, the dark spot became more distinct, until at last it assumed the form and aspect of a horse and rider, which soon thereafter resolved itself into what had been, at the start, his dashing companion. But, alas, how changed! Where were now the freshness, vigor, and impatient confidence which characterized the outset? Where the spirit, elegance, and proud assurance of the start? Gone, all gone, and in their stead, pallor, exhaustion, and dismay. And so they both reached the appointed goal at the *same instant of time*, — the black steed and its rider, broken, strained, and weary; and the old man and his plodding servant, tired, it is true, but ready for a future journey.

So interwoven with and dependent on the brute creation is the prosperity, and even life, of mankind, that often the meanest insect and bird stand sentinel over their property. It would astonish and confound an individual addicted to the wanton destruction of little birds, for example, to learn the value to agriculture of these seemingly insignificant creatures. Permit me to cite an example of the unappreciable utility of only one of them, — the martin, a species of sparrow. From the 15th of April to the 29th of August, eighteen of these birds were once killed, in the stomachs of which were discovered not less than eighty-six hundred and ninety insects destructive to the produce of the farm;

which gives, for each day and bird, a total of four hundred and eighty-three insects destroyed. Even though the senseless butchery of these feathered friends of man were done under the pretence of supplying food for the table, imagine, if you can, how many bushels of wheat, or barrels of wine, or bales of cotton, are represented in each of these little victims! Nor is this war of extermination carried on alone by men; but children of that age, as La Fontaine says, "which is without pity," take part in this wanton savagery by destroying the nests, and killing the helpless young, of these unpaid servants of the tillers of the soil. The sight of a beautiful bird sporting among the trees and flowers is regarded by these thoughtless idlers as a mere target, formed by the Creator for them to mutilate and kill. But let us consider, for a moment, what we protect when we defend the brute creatures. In 1860 there were in the United States nine millions of horses and mules, twenty-nine millions of neat-cattle, twenty-four millions of sheep, thirty-seven millions of swine. Their aggregate value was one billion dollars, having doubled in ten years. Their annual revenue — calculating twelve million of working-horses, mules, and yokes of oxen, at fifty cents per day for three hundred working-days only — is one billion, eight hundred millions of dollars per annum. To this must be added their flesh, and other products of their bodies, making a total revenue of over two billion dollars, — almost as much as our national debt. That from fowl or fish is proportionally great.

A few years ago the farmers of New England were unwise enough to kill a certain race of birds which eat a little of their grain; and the result of their folly was, that the entire hay-crop of that season was destroyed; and, later still, the husbandmen of Nebraska imitated their foolish example by exterminating another friendly bird, which they fed to the hogs in vast numbers; the consequence of which was, that swarms of grasshoppers immediately made their appearance, and annihilated the products of their labors. But there is another aspect to this matter, and that is the moral, which is even more remarkable. In casting our eyes over the numerous catalogue of human crimes and frailties, over the list of those who have perished on the scaffold, or died some other death of violence, — the result of blasted character and the

world's scorn,—it is useful and interesting to know if the germs of their turpitude were perceptible in the days of their youthful innocence; whether the cold-blooded murderer of later life gave evidences of his future ferocity by the torture of dumb, unoffending brute creatures. The tyrant Domitian, while yet an infant, history informs us, foreshadowed that diabolical character which subsequently terrified the world, in his love of cruelty to flies and other insects, by tearing off their wings and legs. A royal child, afterwards Louis XIII. of France, once crushed beneath the heel of his boot a little sparrow which had taken refuge in his bosom; seeing which, the good king his father, Henry IV., exclaimed to his queen, "Wife, I pray that I may outlive that son, else he will be sure to maltreat his mother." And the prediction was verified; for we know that Marie de Medicis died at Cologne at sixty-eight years of age, exiled, and reduced to the greatest extreme of misery, by her son. Henry IV. proved a prophet. Moreover, at the siege of Montauban, this same cruel child, now become a monarch and a man, heartlessly stood by, and mimicked the dying contortions of his Protestant prisoners. Hogarth, you may remember, in his "Four Phases of Cruelty," makes the child that is represented as torturing a dog in the first picture, terminate his career by a murder in the last. Civilization has been aptly compared to a fine diamond, which each succeeding generation polishes a side or angle of. Now, if this simile be correct, it follows, I think, as a natural consequence, that one of these angles must represent humanity to the inferior animals; and that this social gem of ours can never be complete until this one is rendered as resplendent as the rest.

Upon the right bank of the Ganges stands a lofty and beautiful monolith of red granite, bearing inscriptions thereon, which, until lately, could not be interpreted. A learned pundit has, however, deciphered them; and what do you suppose they mean? Why, it is an ukase, made by the reigning sovereign of the time, forbidding cruelty to animals. Think of it, that in distant India, twenty-one hundred years ago, the policy and humanity of mercy to God's inferior creatures was proclaimed, while we in our time have delayed making a similar provision until some dozen years ago! But we have gone to work in earnest, it must be admitted, to

repair this great national wrong; and within the past twelve years thirty-four States of the Union, recognizing the justice and beauty of the example of New York, have incorporated among their laws statutes almost identical with our own. I wish you had the time and the patience to listen to my experience of the prejudice and opposition by which this merciful movement was surrounded in its inception; but this may not be, and I must hasten to a conclusion. Cruelty to animals is in itself bad enough; but it becomes doubly so, when we think of the direful moral consequences it inflicts on the human race. I could occupy the whole day with illustrations, but will content myself by referring to one only. About a year ago I received a letter whose composition and orthography bespoke the writer to be a person of good education and respectability, although poor. It was from a man who said he occupied, along with his wife, the fourth floor of a tenement-house, and their only companion and associate was a cat, which had been allied to them by the ties of friendship for many years. They being childless, loved this speechless creature with real affection, which it returned with almost human fondness. Upon the same floor, and in the rear, the letter went on to say, there resided a cruel and vindictive man, who had just thrown this unoffending animal out of the window into the yard below, whereby its back was broken, and it had died in consequence. "Now," said the affected writer, — "now, Mr. Bergh, I address you this letter, not so much in anger as in sorrow, to ask you to employ the legal authority you possess to make this man realize the crime which he is guilty of, and for this reason: he has a sick wife, whom he is in the almost daily habit of abusing and beating; and I believe, if he was made to feel the wrong he has done to his brute victim, his suffering wife would reap the benefit."

Yes, the practice of cruelty toward inferior creatures, no matter how insignificant they are, is sure to re-act upon the human family. Upon the platform where I have the honor to stand, Mr. President, there are at this moment to be found among the members of your honorable association two gentlemen equally distinguished in their respective callings. One is the intelligent citizen-soldier who has so ably addressed you this day, — Gen. Sargent; the other, the learn-

ed and reverend clergyman who represents so faithfully his heavenly Master among you. I am sure that he and you will pardon me for giving utterance to an unpleasant fact, which has occasioned me no little pain, as well as astonishment; to wit, that the clergy, as a rule, have not given to this humane cause which I serve, the consideration and support which we have a right to expect of them. I will not assume that this apathy arises from a belief that this vast portion of God's creation is soulless, and hence beyond the sphere of their recognition. I only state my experience, and leave you to provide an explanation, if you can, while I relate to you an appropriate anecdote.

The other day, in New York, a gentleman was presented to me, who is doubtless known to you by the peculiar humor which characterizes his writings, — I mean "Josh Billings." "Bergh," said he, after the formalities of presentation were over, "I have long desired to meet you, and take you by the hand. I am in full sympathy with you," he continued, "and, as an illustration of that fact, I will relate to you an incident. I met a clergyman, the other day, and our conversation turned on the work you are doing. To my amazement he poo-poohed the thing, and said there was too much fuss made about these senseless animals; that they were máde to labor and to suffer; and that was all there was in it. 'Look here, parson,' said I, 'it is my opinion, that however religious you may think yourself, even though you were as pious as that entire godly city of New York together, nevertheless it is my belief that you can't get into heaven on a sore-back horse. You may make a dash, and try to get through the gate; but you will be sure to find some of Bergh's men there, who will drive you back. They may let the horse in; but there isn't a ghost of a chance for you!'" Mr. President, I will conclude by repeating these beautiful and appropriate lines, with which most of you are doubtless familiar: —

"A man of kindness to his beast is kind;
But brutal actions show a brutal mind.
Remember, He that made thee made the brute,
That gave thee speech and reason, formed him mute:
He can't complain; but God's all-seeing eye
Beholds thy cruelty, he hears his cry.
He was designed thy servant, not thy drudge,
And know that his Creator is thy Judge!"

FARMS.

WORCESTER WEST.

[Statement of John T. Ellsworth.]

The farm which I enter for the society's premium is in Barre, and known as the Lee Farm, from the fact of its having been in the possession of the Lee family from the time of its first settlement until I became the owner of it, twenty years ago. It contains a hundred and forty-two acres of land, with ample and convenient buildings; and is subdivided as follows, — forty acres of improved land (twelve acres of which was ploughed and cultivated this year), seventy-five acres of pasture, and twenty-seven acres of wood and timber.

My crops the present year are as follows, — three hundred and seventy bushels of corn, forty-four bushels of oats, a hundred and forty bushels of potatoes, three hundred and twenty-five bushels of mangolds, a hundred and thirty-five bushels of large turnips, six hundred bushels of flat turnips, two hundred heads of cabbages, twenty-five cartloads of pumpkins, twenty barrels of apples, and forty-three hundred pounds of pork. I have had the whey from twenty cows' milk besides my own for summer feed for my hogs. My stock is mostly of high grade Shorthorns of my own raising, and consists of a pair of oxen, a bull, twenty-three cows, twelve heifers, six calves, one sheep, three horses, a breeding-mare, two colts, twelve hogs, and forty-one pigs. I cut about sixty tons of hay, a ton of green rye, two tons of Hungarian grass, and three tons of rowen. My hay-crop is not an average yield, on account of drought of previous years.

From April 1 to Oct. 1 the yield of milk from twenty-three cows was 91,870 pounds, from which was made 2,297

pounds of butter, and 6,694 pounds of cheese. For the remaining six months of the year I estimate one-third as much, or 30,600 pounds of milk more.

My first green crop which I feed to my cows is winter rye, which I commence to cut and feed in the stable as soon as the grain begins to head, and continue to use it so long as it remains green. Next I use grass mown in early, rich places, where it would lodge and spoil, if left to be cut for the hay-crop. Then I use green oats, which are sown thickly upon rich, well-tilled land. When this is past, Stowell's evergreen sweet-corn is large enough to cut, which I continue to use till frost comes. Corn I consider the most valuable of all green crops for the dairy. The last crop of the year, and the best one too, considering its cost, I think, is the flat turnip, which I feed to my cows till the ground freezes. I feed them, strewn upon grass-ground, after the cows have been milked.

I have commenced a system of improvement of my worn-out pasture-land, by taking out the stones, ploughing, cultivating, manuring, and re-seeding. In this way I expect to restore my pastures to that abundant supply of sweet, milk-producing grass that was produced so abundantly in former years. This I do in small sections, as fast as my regular farm-operations will allow.

BARRE, Oct. 15, 1877.

FARM-WORK.

ESSEX.

[From the Report on Town Teams.]

Within a few years a great change has taken place in the manner of doing farm-work, particularly that requiring animal labor. Horses have, to a great extent, been substituted for oxen; and we now find few farmers owning working-oxen. This has resulted from several causes. The small profit in making beef since the supply has come mainly from the West, the greater quickness with which many kinds of work can be performed by horses, and the high price of fodder in past years, have all contributed to this result. But we have sometimes thought that farmers have gone too far in this direction; and we hold that the comparative value of horses and oxen for ordinary farm-labor is really quite an important question for every farmer.

Undoubtedly the use of horses is most economical for the performance of many kinds of work, such as ploughing "old ground," harrowing, and many kinds of teaming; but yet there are some things which can be done best by oxen. It is seldom that a horse-team can turn over grass-ground so well as oxen, especially if the ground be rough or stony; and generally, for any kind of work requiring especial strength and steadiness, oxen are preferable. Still it is absolutely necessary for every farmer to keep a horse, and of course, if he can perform all his work with it, he does not need a pair of cattle. But if his farm is large enough to require more animal labor, then it becomes a question whether he had better employ oxen or horses.

There are several points to be considered in deciding this question, which will readily suggest themselves; but we will refer only to one or two. If the farmer has carts and har-

nesses for horses, and no equipments for oxen, he must consider whether it will pay him to go to the expense of an outfit for an ox-team. If his business is such as to require a large amount of teaming on the road, he must consider whether his work cannot be done more economically by horses. But then we suppose it is the experience of almost every farmer, that, when he finds it necessary to sell his horse, he cannot get as much as he gave, even if his horse has not depreciated in value. We do not think this applies particularly to farmers, but suppose it to be a general law, — with now and then an exception, — that the man who buys a horse does not usually get his money back when he sells. The animal is subject to the ten thousand ills to which horse-flesh is heir; and he is liable any day to find, even if he buys a sound horse, that by some unlucky wrench or strain, or carelessness, fifty per cent of the value has vanished. If he makes an unlucky trade, and finds that his horse has some quality which he doesn't like, or is utterly wanting in the traits he most desires, he cannot easily sell, but must wait months for a customer, and then sell at a low figure. It is true it is not much easier to find a customer for a poor, thin pair of oxen, than for a horse; but we don't believe a good farmer will often have that kind of oxen. If oxen are fat enough for beef, they will always sell at the market-price; so that, if one buys a pair of cattle to work for a short time, he need not lose any thing if the price of beef remains the same.

The difference in the cost of keeping a pair of horses and a seven-foot pair of cattle for a year is not very much. The oxen probably cost the most in the winter, and the horses in the summer. We do not advocate the use of oxen for farm-work by every farmer; but we think, that, by proper management, they can be used profitably to a greater extent than they are. And the first and principal point is to buy the right kind of cattle. It is a common notion that it is most profitable to buy thin cattle, and by good keeping get them fat, thus making a gain. We believe this is a great mistake. Our own experience is, that the most unfortunate trades we ever made were in buying that kind of stock. There is always some reason why cattle are thin; and, unless we know all about them, it is impossible to tell whether it is for want of good keeping, or because they are dainty, or by reason of

hard work. If it is because of poor keeping, they will thrive and fatten on good living. But nine times in ten cattle are thin and lank either from daintiness or hard work. There is nothing more provoking than to see cattle poke over their feed, only eating the choicest bits; and it is almost impossible to fatten such stock. And, as far as profit is concerned, one might about as well turn his grain into a rat-hole as to feed it to cattle that have been worked down thin on good keeping. If one finds himself possessed of such a pair, he cannot easily sell them for work, and cannot fatten them in any reasonable time, and he concludes that ox-labor is very unprofitable.

Instead of buying such stock because it seems cheap, we believe it better economy to purchase young, thrifty, good-shaped stock, already in condition to make decent beef. The first cost may be a little greater; but so will be the receipts when they are sold. If they are fat, good provender will keep them so; and the chances are, that they will continue to gain. If they do not work well, they can be sold any day to the butcher for the market-price. It will also generally be found that good-natured, docile animals — such as take on fat readily, and "keep themselves well" — are the best workers. The fractious, high-tempered cattle worry more at their work, are more liable to be abused by drivers, and consequently do not thrive as well.

We have found too, that oxen fat enough for the butcher, if good shaped and thrifty, stand the heat better than thin ones.

Other points, such as the breed of cattle best for farm-work, the most economical mode of feeding, and kindred questions, might be discussed; but this paper is of sufficient length. To sum it all up, we believe that every farmer will do well to consider whether or not it is prudent for him to employ oxen instead of horses; and also, if he decides to do so, that he should be careful in his purchase, and see whether, in the matter of oxen, it is not cheapest in the long-run to buy the best.

JOS. S. HOWE, *Chairman.*

[From the Report upon Draft-Horses.]

It has, of course, occurred to the mind of every farmer, how rapidly oxen as beasts of labor are being superseded by horses. But perhaps it is worth recording in the Transactions of our Society, that, in the year 1870, the United States had 7,145,370 horses, — nearly one-eighth in the whole world. This fact alone demonstrates that to us as a nation the horse is a matter of importance, — of supreme vital importance, — and should be treated accordingly; should be bred according to scientific principles; should be reared, handled, and trained with care; and the result will show, as it has already shown in the United States, that what contributes to the welfare of the whole country also contributes to the individual welfare of all classes, of all citizens, but more particularly to the farmer, with whose interests he is closely identified.

It is our belief, and it seems to be the universal judgment in this section of the country, that kind, tractable horses, weighing from a thousand to twelve hundred pounds, are best adapted to the present wants of the New-England farmer; and we would urge, that, in the selection of draft-horses, especial attention be given to their *fast walking*, as well as to their good working-qualities.

HORACE F. LONGEELLOW, *Chairman.*

PLOUGHING.

WORCESTER SOUTH.

[From the Report of the Committee.]

The importance of the proper preparation of the soil for the reception of the seed cannot be too highly estimated. The correctness of this proposition will be readily admitted by those who remember the fact that such a preparation is absolutely necessary to insure paying success in the raising of any given crop. Not only is the germination of the seed affected by neglect in this matter; but the future growth of the embryo plant will also be seriously, if not disastrously, retarded by it. The laws of nature will not be annulled nor suspended to accommodate those who from ignorance neglect, or from shiftlessness fail, to obey those laws.

The complete and thorough pulverization of the soil is essential in order that the tiny and tender rootlets of the growing plant may not be hindered nor baffled in their tireless search for subsistence. In this preparatory work the plough performs the initial, and, in some respects, the most important part; for no succeeding operations with harrow, cultivator, horse or hand hoe, can compensate for the failure of the plough to do its work well. The application of scientific rules and principles in the construction of this important implement, so as to secure ease in draft as well as in the holding, has made this part of the work comparatively easy and pleasant to both team and ploughman.

To secure first-class work (and no other will answer the purpose), three things are absolutely necessary, — a good plough, that is, one well adapted to the nature of the work to be done, a well-trained and able team, and last, though by no means least in importance, a skilful ploughman. The improvements in the construction of the plough that the last

forty years have witnessed have been wonderful indeed. The contrast between the clumsy, ill-constructed, and unsightly wooden plough, shod with wrought iron, used forty years ago, and the trim, bright, and sharp-cutting steel plough of to-day, though great indeed, is not greater than the difference in the character of the work performed. The "cut and cover" work of former years, with, in many instances, but a precious little of either "cut or cover," has been succeeded by the well-cut, neatly-turned, and properly-disintegrated furrow of to-day, with the difference in ease of after-cultivation, and the ultimate results secured as widely variant.

One of the requirements in the regulations that governed the work of to-day was the turning of a "flat furrow." Whatever the advantage, if any, of a flat furrow may be on level land, your committee are decidedly of the opinion that a slightly inclined furrow on our hillside fields has a decided advantage of the flat one, as it will, to some extent at least, prevent the washing by heavy rains of the upturned soil to the bottom of the hill; and, further, many good farmers claim that the inclined furrow gives a better opportunity for the circulation of the air under the same, thus aiding in hastening the decay of the buried vegetable matter; and, further still, the soil will be less likely to become compact. We suggest that this matter is entitled to candid thought and carefully conducted and thorough experiment.

Another requirement was, that the ploughman should also be the driver. We regard this as a wise regulation. The necessity for the economizing of labor in our time is a sufficient reason, if there were no other, why the team should be trained to work under the sole guidance of the ploughman. This result can be obtained very easily and in a short time with any team that is fit to be employed in the general work of the farm; and oxen that cannot be so trained should be fitted for the shambles with all possible despatch.

HENRY E. HITCHCOCK, *Chairman.*

FARM-MANAGEMENT.

ESSEX.

COMPARATIVE VALUE OF CROPS FOR FODDER.

BY ANSEL W. PUTNAM.

The feeding-value of crops depends upon the conditions under which they are fed, as well as upon the character of the crops. There may be conditions under which a ton of meadow hay, worth in market fifteen dollars, has a higher feeding-value than a ton of upland hay, worth in market twenty-five dollars.

Fodder-crops are now classified according to their ratio of albuminoids to carbo-hydrates. Animals to be fed are divided into two classes, — those at work and those at rest. Animals that are being fatted, or that are giving milk, are classed as work animals. The fodder tables, founded upon German experiments, published by Professor Atwater of the Connecticut Experiment Station, show that it is not good economy to feed animals at rest with food rich in albuminoids: such food should be saved for animals at work.

The results of a winter's experience with these tables may interest some members of the society. The summer of 1876 was very hot and dry: the hay-crop and crops for soiling were short, and, when winter came, there was very little in the barn. Whether to sell stock, or buy food, was the question to be answered. After a careful study of the tables, and of the market-price of the different kinds of fodder, it was decided to buy food. A comparison of the tables with the price-list showed that carbo-hydrates would be furnished at much lower rates in bog-meadow and salt-marsh hay than in good upland hay; and that albuminoids were lowest in shorts and cotton-seed-meal. A car-load of shorts was bought at sixteen dollars per ton, and four tons of cotton-

seed-meal, at twenty-six dollars per ton. Meadow hay was bought at eight dollars per ton in stack on the meadow; some fine salt hay, at twelve dollars; some early-cut black-grass, at sixteen dollars. For two months my milch cows were fed a mixture of bog-meadow, salt hay, and black-grass, at an average cost of twelve dollars per ton, and my dry cows a mixture of bog-meadow and salt hay, at an average cost of ten dollars per ton. Cows that were giving from fifteen to eighteen quarts of milk a day were fed eight pounds of shorts, six pounds of corn-meal, and four pounds of cotton-seed-meal each, per day, Cows that were giving less milk had a smaller allowance of grain. The dry cows had no grain or roots with their ten-dollar hay.

I never have had cows give more milk than they gave on that twelve-dollar hay; and the dry cows kept in good condition. My horses were fed the same hay, and did well on it. Between two and three months there was no upland hay in the barn. Towards spring, meadow hay and good salt hay were scarce. The roads were bad, and some baled hay was bought: it was not first quality, was over-ripe, and it did no better than the other mixture, though it cost more. Late in the spring I was in a neighbor's barn: he had some river meadow hay that he asked fifteen dollars a ton for, and some early-cut upland hay that he asked twenty-five dollars for. He said the meadow hay would do for dry stock, but there was no milk in it; but the upland hay would make milk. I told him I would take a small load of the meadow hay. It weighed fifteen hundred pounds; cost eleven dollars and a quarter. I fed it from the wagon, and fed no other hay while it lasted, which was just one week. All the hay sixteen cows and three horses had for one week was that fifteen hundred pounds of meadow hay; and they had all they wanted of that kind of hay. They produced thirty-six dollars' worth of milk from that eleven and a quarter dollars' worth of hay, and the grain that was put with it. There were three or four dry cows in the barn at that time; but the cows that were giving milk gave enough to pay for all the hay and grain that was eaten for the week by all the stock, horses and hens included.

The merit of meadow hay lies in its bulky character, and in what may be called its stand-by capacity. A daily ration

of twenty pounds of meadow hay will, I think, make larger paunches, and keep fuller stomachs, than thirty pounds of early-cut upland hay: this is why it is valuable to feed with large quantities of grain; and for animals at rest it does not take as much to keep them full.

Why is it that dry cows and young stock, classed as animals at rest, are often so poor in the spring, when fed on salt-marsh and meadow hay? It is because, though classed with animals at rest, they have no opportunity to rest: an animal cannot rest unless it is comfortable. On one of the coldest mornings of last winter I went to a neighboring town for hay. At the barn where I loaded, I saw cattle eating the same kind of hay that I was after: they were very poor, and looked as though they were growing poorer. Why? The barn was very open and cold, — nearly as cold as out doors, — the hips and sides of the cattle were covered with frozen manure: they were curled up and shivering with the cold. It made my teeth chatter to look at them. And, when I asked for some water for my horses, they told me that their stock drank out of a hole back of the barn; but horses not used to it would not drink it: they would bring me some from the house. It is not strange the stock was poor; but it is strange that they were alive. Now, look at the conditions under which I fed the same kind of hay. The same morning, with the thermometer below zero out of doors, the one hanging behind our cows stood at forty degrees above zero; the cows were clean, and they had clean and dry beds to lie on; they had an opportunity three times a day to drink as much good well-water as they wanted (temperature of the water about forty-six degrees); and they had the privilege of drinking in the barn, where it was warm. The cows were comfortable; *they were at rest:* and under these conditions the ten-dollar hay kept them in fair condition, at a cost of ten cents per day.

Last year the writer advised those accustomed to feeding salt and meadow hay, with the result of poor stock in the spring, to buy cotton-seed-meal to help utilize the carbohydrates in the poor hay. But, after another year's experience and observation, my first advice to all such is, Keep your stock warm, and give them all the good water that they need, and see if the quality of your hay is not good enough to keep animals that are comfortable, *and at rest*, in fair condition.

A knowledge of the relative value of clear corn-meal to cob-meal, and also of the difference in feeding-value of our round, home-grown corn and the flat Southern and Western corn, is very important, at this time, to help farmers settle the question whether it is best to grow corn. German experiments show that seventy-one per cent of clear corn-meal is digestible, and that fifty-two per cent of corn-cobs is digestible matter. If we allow seventy-four pounds of ears to give fifty-six pounds of clear corn, a hundred pounds of ears will give 75.6 pounds of corn, and 24.4 pounds of cobs. 53.6 pounds of the corn, and 12.6 pounds of the cobs, are digestible; making 66.2 pounds of digestible matter in cob-meal to seventy-one pounds in clear meal, or about as thirteen to fourteen. It is well to bear in mind that most of the digestible part of corn-cobs is carbo-hydrates, and that, to get the full value of cob-meal, it needs to be fed with other food rich in albuminoids.

Many are ready to admit that a hundred pounds of cob-meal made from round corn is worth as much to feed as a hundred pounds of clear meal made from flat corn. Some, after changing from one to the other, back and forth, for several times, claim that the same quantity by measure of cob-meal is worth as much as the clear meal bought at our mills. There are sixty-four quarts in a hundred pounds of clear meal, and eighty-six quarts in a hundred pounds of cob-meal. If a quart of our Northern cob-meal has the same feeding-value that a quart of clear Western meal has, then, at the present time, a hundred pounds of cob-meal are worth $1.80. My experience has led me to put the value of a hundred pounds of ears in the corn-crib, when dry enough to grind, at the price of meal per bag at the mills. It costs us twenty cents per hundred pounds to get our cob-meal ground. I think a hundred pounds of it worth, for making milk, twenty cents more than a bag of the average meal we get at the mills.

The value of the cobs, and the difference in quality between the round and flat corn, are important items in making up statements of the cost and value of the corn-crops grown in our county; and yet these items have generally been overlooked. Take, for example, the statement of James P. King for this year. He reports 7,650 pounds of ears, allows eighty-five pounds of ears for a bushel, and calls a bushel worth

seventy cents; ninety bushels, sixty-three dollars. If I had such a corn-crop as that, I should say, 7,650 pounds of ears, worth in crib, $1.35 per hundred pounds: cash value of corn, $103.27. This may seem too high to many, if they have not carefully watched the practical working of cob-meal. But I think a large majority of the farmers in Essex County who have grown corn this season will admit that four quarts of cob-meal are worth as much as three quarts of the clear corn-meal. On that basis we have 7,650 pounds of ears, worth in the crib $1.15 per hundred pounds: cash value of the corn, $87.97.

It is well for the farmers of Essex County to know the full value of their meadow hay, butt-stalks, and corn-cobs. It is also well for them to know the exact conditions under which they can realize full value for all their crops; for economy in using is as important as economy in producing.

RECLAIMED MEADOWS.

PLYMOUTH.

[Statement of Galen Latham of East Bridegwater.]

The piece of reclaimed meadow I offer for premium, containing about three acres, lies in the same enclosure with, and on the upper side of, the two acres and a half for which I was awarded a premium in 1874. The soil, of a peaty nature, is about eighteen inches in depth, with a clayey subsoil. The former product was bushes and flat grass, except a small portion, from which was recently cut a large growth of maple-wood. The lot was drained by opening ditches connecting with those through the lower and reclaimed portion, and by clearing and lowering those through my own and an adjoining meadow for about forty rods.

The treatment of this piece has been similar to that of the first, except in that I first ploughed the meadow, while in this I applied the gravel directly to the surface. I consider the last method much the best, as I think the bulrush and other foul grasses are less liable to start under this treatment than when the meadow is ploughed, unless it is cultivated and thoroughly rotted before seeding to grass. In the winter of 1873-74 I applied from two to three inches of gravel over the most of the piece, top dressing with manure, and harrowing it in with the grass-seed in February or the early part of March. Herd's-grass, red-top, and blue-grass were the kinds of seed sown. The most satisfactory result was obtained in the season of 1875, on the piece from which the maple-wood was cut. This piece, in order to remove the stumps and roots more thoroughly, was broken up and ploughed in the fall of 1873, and planted to potatoes in 1874, with manure in the hill. On account of the extreme wet weather of that season, the potato-crop was a failure. It was then treated to a coat of gravel and sandy loam, without any manure, and sown to grass Feb. 25, 1875. About Aug. 1,

the grass on this portion was cut, and carefully estimated at not less than two tons per acre. The present year, perhaps, on the whole, has been the most satisfactory, as the severe drought of last season injured that crop very much, — in some places almost killing the roots. Instead of an uneven, miry bog, producing an almost worthless crop, I now have a good English meadow, smooth, and easily worked, that I think capable of producing more hay, with a given quantity of manure, than the same number of acres of upland on any portion of my farm. The improved appearance from the street is also a great satisfaction.

EXPENSES.

Gravelling three acres	$120 00
Manure	60 00
Draining	15 00
Ploughing, and removing stumps	10 00
Grass-seed and sowing	10 00
	$215 00

RECEIPTS.

1874, two tons hay	$30 00
1875, three tons and a half hay	52 50
1876, three tons hay	45 00
1877, four tons hay	60 00
	$187 50

IMPROVING PASTURE AND WASTE LAND.

ESSEX.

[From the Report of the Committee.]

Benefits resulting from experiments upon unproductive tracts of land are very apparent; and any improvement advancing the value of farms is of pecuniary benefit, not only to the actual owner of the soil, but to the community as a whole. No prosperous business can be carried on, which confines the advantages to be derived within a narrow circle, as success in one branch of business assists another. Each acre of land now unproductive, that is made to produce any description of crop whatever in paying quantities, adds so much to the general welfare of the whole, and should thus be recognized.

The experiments of Mr. Horton are only starting-points, from which others may begin, and extend their operations, and prove more successful than they have heretofore been. We cannot rest on present results with a confidence that nothing more permanent or productive can be realized. The wheels of improvement are constantly moving; and happy is the originator of any experiment which will tend to accelerate the movement towards prosperity. Every unproductive acre of land treated by Mr. Horton's method is enhanced in value, and makes the owner thereof more prosperous and wealthy.

Your committee would reccommend to all to try experiments upon some piece, large or small, marking the results, and keeping a full record of every item of expense and the amounts realized, preparatory to a more extended and thorough development upon a larger scale.

AMOS POOR, *Chairman.*

[Statement of Joseph Horton.]

The land I offer for your inspection has been in pasture many years, not having been ploughed or cultivated within the memory of my oldest neighbors. It measures a hundred and fifty-two square rods. The soil varies from a stiff clay, to a light, yellow loam; and the surface, for the most part, is covered with small, low bushes.

Treatment.—With a strong pair of oxen and a medium-sized plough, with a straight, sharp coulter reaching to the point, I ploughed off the hillocks and ridges, frequently assisting the team by cutting through the roots with an old axe. After ploughing, I left the furrows exposed to the sun for a few days, then cut and carted them into a heap to burn.

A fire was started at once, and kept burning until every thing was consumed. The field was then ploughed, rolled, and harrowed, in the usual manner, and seeded to winter rye; nine cart-loads of ashes, the product of the fire, being applied as a dressing.

The next spring the piece was sown to grass, as the rye, which looked well in the fall, was badly winter-killed. I got but ten bushels of rye. The following gives the cost of the improvement:—

Cr.		
By 10 bushels of rye, at $1	$10 00	
$2\frac{1}{4}$ tons of hay, at $20	45 00	
		$55 00
Dr.		
To 2 men and 1 pair of oxen ploughing off sods 1 day	$6 00	
2 men and 1 pair of oxen clearing off sods 2 days	12 00	
2 men and 1 pair of oxen ploughing off sods 1 day	6 00	
1 man and one pair of oxen harrowing and rolling 1 day	4 00	
2 men and 1 pair of oxen spreading ashes half-day	3 00	
Cost of seed, rye and grass	3 00	
		34 00
Balance in favor of improvement		$21 00

The grass was of the first quality, and was estimated by the committee to average two tons per acre.

To satisfy others as to the value of these ashes, I selected

a piece adjoining the former, that was free from bushes, and, after the usual preparation, sowed it to grass.

The piece measured a hundred square rods, or five-sevenths of an acre; and, instead of ashes, eight heaping cart-loads of stable-manure were applied as a dressing.

The committee saw the grass upon both pieces; and my figures in regard to the crops are taken from their estimate. The following is the cost of preparing the second piece: —

Cr.		
By 28 hundred-weight of hay at $20 per ton		$28 00
Dr.		
To 2 men and 1 pair of oxen ploughing 1 day (nearly) .	$5 00	
1 man and 1 pair of oxen harrowing and rolling .	3 00	
Carting and spreading manure	6 00	
Seed	1 00	
Value of manure	16 00	
		31 00
Balance		$3 00

Notwithstanding the great amount of opposition that I have met with from those who consider themselves authority, I still persistently adhere to my former opinions, both as regards the value of the ashes, and the method of clearing.

EXPERIMENTS WITH MANURES.

ESSEX.

[From the Report of the Committee.]

Mr. Ware's statement leads one to infer that the main point of his experiment was to determine which of two prominent commercial fertilizers is the best for his land. For that purpose the experiment was very successful; for one gave a much better crop of corn than the other. But, as Mr. Ware did not test the productive capacity of the land without manure, we have no data from which to calculate the cost of the corn produced by either fertilizer.

The main point of Mr. King's experiment seems to have been to determine whether it is good economy for him to grow corn with the Stockbridge Fertilizer. His crop was large; his land was evidently in good condition without the fertilizer: but, as he did not test its capacity, we cannot tell how much the fertilizer increased the crop.

Mr. Appleton's experiment was a test between the Stockbridge and stable-manure, with present results very much in favor of the Stockbridge Fertilizer.

I think it well for practical farmers, one and all, to admit that chemical fertilizers are, and are to be, to stable-manure, what coal is to wood, what kerosene is to whale oil: they are to come out of the earth to supply the wants of man, when the surface-supply gets short.

The first question for every farmer to ask about chemical manures is, Do I need them at present prices? Second, If needed, how shall I determine what is needed? Some buy what is supposed to be a complete fertilizer for all plants. If they get this, they get what is needed, and probably pay for much that is not needed. Some buy a complete fertilizer for the special crop they wish to grow: if they get this, they get what is needed, and perhaps some that is not.

The Connecticut farmers, under the advice and direction of Professor Atwater of the Connecticut Experiment Station, are finding out what their land needs, by experimental tests with separate ingredients of plant-food. By so doing they are cultivating their powers of observation, and reducing the cost of fertilizing to the lowest point.

Professor Atwater says, "Chemists cannot prescribe for soils as doctors do for patients." He also says, "Stable-manure is a complete fertilizer. It contains all the ingredients of plant-food; and its organic matter improves the mechanical condition of the soil besides. It is a standard fertilizer, and useful everywhere. To learn by what artificial fertilizer this can be supplemented in any given case, is, as I have often insisted, best settled by experience and experiment."

Mr. Ware's experiments show that Darling's Animal Fertilizer is much better for growing corn on his land than the Stockbridge; also that the Stockbridge grew better onions than stable-manure.

Mr. King's experiment shows that the Stockbridge Fertilizer works well on his land, and, if he can continue to grow such crops year after year with the same amount of fertilizer, he can get his corn cheap; but, if Darling's will do as much better for him as it did for Mr. Ware, he can grow it still better with that.

Mr. Appleton's experiment is the most interesting to me, because the Stockbridge Fertilizer is brought in competition with stable-manure. Mr. Ware's experiment, combined with Mr. Appleton's, shows me that I do not need either the Stockbridge or Darling Fertilizer; for I can get all the good barn-cellar manure I think it good economy to use on what land I have at four dollars per cord, or less, including the cost of putting it on the land. I get it by buying hay and grain, and making milk and manure. Since the spring of 1874 I have bought between three and four thousand dollars' worth of hay and grain for making milk. I know the milk has paid for the hay and grain, besides keeping the stock of cows good; and that the labor of tending stock and manure will not amount to more than four dollars per cord for the manure, after it is spread on the land. I have barn-room enough for as many animals as I have acres of land,

and a ready market at the door for as much milk as I care to make. These are conditions which few farmers have; but, under these conditions, I have no need for chemicals. If Mr. Appleton had been able to get stable-manure for four dollars instead of ten dollars, the cost of manure and fertilizer would have been about equal, and the manure-crop would have been twenty-two bushels and a quarter of ears more than the fertilizer crop.

Admitting that the Darling Fertilizer would have done as much better for Mr. Appleton as it did for Mr. Ware, the manure-crop would still have been ahead. The fertilizer question is a very important one to the market-gardener who has to buy all his manure; and experiments which determine the relative value of chemicals to stable-manure are very valuable to all who purchase manure. There is a valuable lesson to onion-growers in Mr. Daniel Carlton's plan of using barn-manure one year, and Cumberland superphosphate the next, on the same land, and thereby growing premium onions every year.

It is safe to add, that one reason why farmers need so much is because they have let so much run to waste. My advice to all is, to save all before buying any.

ANSEL W. PUTNAM, *for the Committee.*

[Statement of Benjamin P. Ware.]

The one acre of land upon which the following experiment was tried was ploughed up four years ago, having been in grass for eight or nine years before, and was quite run out. It has a gravelly subsoil, is level, and is what would generally be considered good corn-land. The first year after breaking up, it was manured with seven cords of good compost manure per acre, and planted with squashes. The second year it was manured as above, and planted with potatoes. The third year it was manured with sufficient of the Stockbridge Corn Fertilizer, purchased of W. H. Bowker & Co., to produce, according to his formula, seventy-five bushels of corn per acre over and above the natural yield of the land without any fertilizer, which I considered would be forty bushels per acre; and the product was eighty-one bushels of very sound shelled corn.

The fourth and last season I divided the acre into two equal parts, with no noticeable difference in the quality or location of the land. After ploughing, I spread upon one half, which I will designate as lot No. 1, seven hundred and four pounds of Darling's Animal Fertilizer, bought of Whittemore Brothers, costing, with freight, $15.08, and forty pounds of muriate of potash, costing $1.40, both amounting to $16.48. On the other half, lot No. 2, I spread three bags of Stockbridge's Corn Fertilizer, which, according to his formula, was expected to produce at the rate of sixty bushels per acre above the natural product of the land, costing, with freight, $17.25.

The corn was planted with Ross & Co.'s corn-planter, and cultivated wholly with his cultivators, without any hand-labor, except pulling out a few scattering weeds that the cultivator failed to cover sufficiently. This system left the crop clean of weeds, and reduced the cost of cultivation very materially; which cost of cultivation, and harvesting in the barn, I make $19.50 for the whole acre. The product of lot No. 1 of sound ears of corn was twenty-five hundred and ninety-seven pounds, of which it took seventy-four pounds to make fifty-six pounds of shelled corn, making thirty-five bushels and one-tenth of shelled corn. The three thousand and seventy pounds of stover at $8 per ton would be worth $12.28, which being deducted from the cost of production — fertilizers, $16.48 + half of cultivation, $9.75 = $26.23 — would give the cost of thirty-five bushels and a tenth of corn $13.95, which is thirty-nine cents per bushel. The product of lot No. 2 was two thousand and eighty-five pounds of ears, equal to twenty-eight bushels and a tenth of shelled corn, and twenty-three hundred and sixty pounds of stover, valued at $9.44, which deducted from cost of production — fertilizer, $17.25 + cultivation, $9.75 = $27.00 — leaves $17.56 cost of twenty-eight bushels and a ninth, or sixty-two cents and a half per bushel; thus showing, that, all other things being equal in this experiment, it cost thirty-nine cents to grow one bushel of fifty-six pounds of shelled corn with Darling's Animal Fertilizer, and sixty-two cents and a half with Stockbridge's Fertilizer.

In connection with the foregoing I also submit the follow-

ing experiment, not carried out with so much exactness, but showing important results : —

On one-half acre of good strong land that had been well manured for two years, and upon which onions were sown last year, the crop was a failure, owing to an unfavorable season. Upon four-sixths of this lot I spread, after ploughing, four bags of Stockbridge's Onion Fertilizer prepared by W. H. Bowker & Co., of whom I purchased it for six dollars per bag, costing at the rate of seventy-two dollars per acre; and on the rest of the lot I applied good compost manure, such as I thought would be suitable for onions, at the rate of eight cords per acre, costing, I judge, when applied, nine dollars per cord, or seventy-two dollars per acre. I called upon several disinterested gentlemen to examine the crop when growing, and pass judgment upon the different parts of the piece; and all agreed with me, that, without measurement, the crop where the Stockbridge Fertilizer was applied was considerably better than where the manure was used, the cost being the same.

In submitting the statements of these experiments on the application of manures, I desire to call your attention to the importance, at the present time, of carefully conducting such experiments, that we, as practical farmers who have a living to get by our farming-operations, may be able to decide, first, Can we afford to buy the chemical fertilizers at the prices demanded for them? and, if so, are they an economical substitute for animal or barn manure? Or, if used, will our lands retain their present fertility, or increase it, by their use? These are vital questions, that can only be decided by careful experiments and for several years. And I trust the members of our society may take an active part in solving these questions to our benefit.

[Statement of James P. King.]

The crop of Indian corn which I offer for premium as an experiment grew on one acre of land. The land is of a black soil, with somewhat of a clay bottom. The land was first ploughed in 1875, eight inches deep, and bore a crop of cabbage the same year, with about five cords of manure of

inferior quality. In 1876 I planted the same piece with potatoes, using about the same quantity of dressing, of good quality, from my barn-cellar. The present year I planted the same piece to Indian corn, using twenty dollars' worth of Stockbridge Fertilizer, — a little less than is recommended per acre for corn. It was planted June 5 in rows both ways, hills three feet and a half apart, putting the fertilizer in the hill, with the following result: Cost of ploughing and harrowing, five dollars; cost of fertilizer, twenty dollars; hoeing with horse-hoe, two dollars; cost of cultivating six times, nine dollars; cost of weeding twice, by boys, two dollars; cost of seed and planting, four dollars; cost of harvesting and storing, ten dollars. Weight of corn on the ear, 7,650 pounds. Estimating eighty-five pounds of corn on the cob to make a bushel of shelled corn leaves ninety bushels per acre.

90 bushels of corn, at 70 cents per bushel . . .	$63 00
Value of stover	20 00
	$83 00
Deduct expense	52 00
	$31 00

The above statement I believe to be correct.

[Statement of Francis H. Appleton.]

I have this season used some of the Stockbridge Fertilizer for corn, which is manufactured by W. H. Bowker & Co., Boston; and I believe that the facts which I give herewith will be interesting and useful to farmers.

I have carefully surveyed the land, and computed as accurately as possible the labor, &c., employed, and the results. I have also, for the sake of comparison, studied in a similar way a piece of land planted to corn, and manured with stable-manure.

The land was all manured the season of 1876 with stable-manure (about six cords to the acre), for potatoes, on an inverted grass-sod. This year's corn-crop got an earlier and better start on the fertilizer piece than on the stable-manure piece, both pieces being planted at the same time.

The question arises, as to how much each crop depended upon the manure left by the potatoes of 1876; also how much succeeding crops will benefit by the manure left in the land from the stable-manure applied this season, and whether any of the fertilizer remains in the land for future use.

The larger crop on the manured piece cost more to harvest, as is shown by the figures. In my cost the manure has to be hauled seven miles. Every farmer can calculate the comparative cost of fertilizer and stable-manure, which must vary according to circumstances. I have reduced the results to an acreage, and give them below:—

Total cost of raising crop, including interest and taxes, labor in planting, tending, and harvesting per acre, not including cost of fertilizer	$36 08
Cost of fertilizer (Stockbridge manure)	23 03
	$59 11
2,613.19 lbs. tops, 5,536.30 lbs. butts } 8,149.49 lbs. stover, at $8 . .	32 30
112½ bushels corn on cob, per acre	$26 81

Total cost of raising crop, including interest and taxes, labor in planting, tending, and harvesting per acre, not including cost of stable-manure	$38 33
Cost of six cords stable-manure, delivered on farm .	66 00
	$104 33
2,655.67 lbs. tops, 5,669.62 lbs. butts } 8,325.29 lbs. stover, at $8 per ton .	32 66
134¾ bushels of corn on cob, per acre	$71 67

The corn was equally good and of excellent quality in each case.

FRUITS.

ESSEX.

NEW WINTER APPLES.

[From the Report of the Committee]

There has been offered for several years the liberal premium of a hundred dollars for a new kind of winter apples equal to the Baldwin or Roxbury Russet. We suppose it means for late keeping as well as for quality. We well remember the discussion that took place among the trustees about offering this large premium. It was said by some of the oldest and most experienced members, that, in their opinion, apple-trees would in time deteriorate, and become less productive, and the fruit inferior in quality; and the importance of new kinds of late-keeping apples was particularly alluded to. If it is a fact that apples deteriorate, as above stated, it is wise to look for new kinds. Notwithstanding the large premium that has been offered, we believe there has been no application for it.

We well remember the old orchards and the great quantity of apples they produced in our early days, nearly all of which were made into cider, as there was but little or no market for them within a reasonable distance.

There were several kinds that originated in our neighborhood, that were of superior quality, which would not have dishonored the tables at our county fair. The origin of those trees, some of which are yet standing, would, we think, date back about a hundred and fifty years. The Methuen Pippin, the Bean apple, the Orange apple, the Red apple, and other kinds, are all now in existence in our locality, but have so deteriorated, that they are now considered of but little value.

The Roxbury Russet, we suppose from the name, originated in Roxbury; as to the time, we have no knowledge. Among

our earliest recollections were the Russet trees on our father's farm, one of which was sufficiently large to bear several barrels of apples. Even now in imagination we can see the tree loaded with large fair fruit, yellowed with golden russet, tinged with red from the rays of the sun; and, when kept till spring, they tasted quite as well as they looked on the tree.

There was the Rhode-Island Greening (which came, as we have been informed, from Rhode Island), which produced, like the Russet, very beautiful fruit, but which now, like the Russet, has greatly deteriorated. There was but little encouragement at that early day to cultivate apples for market, as Salem was the only market; and the manner of conveyance was such that it was not easy to convey them there. The most of the marketing was done at that time on horseback. We well remember seeing the horses loaded with sacks containing the products of the farm, such as butter, cheese, eggs, poultry, and other light articles; and sometimes grain was carried on horseback. The good women also sometimes went, carrying the products of the dairy, the spinning-wheel, and loom. These companies would naturally remind one of the children of Israel carrying corn in sacks out of Egypt.

It will be seen at once that apples would be an inconvenient article to carry on horseback; and, as there were no wagons, our father adopted the following plan for carrying his apples to market. He took the top of his chaise from the carriage, then placed boards on the axle and crossbars, on which he placed his bags of apples and other things he carried to market.

As to the price of apples at that early day, we recollect hearing our father say that he got a barrel of flour for four bushels of apples. He sold his apples for two dollars per bushel, and paid eight dollars per barrel for the flour.

A man who is our senior in years related the following incident. He says the first wagon he recollects ever seeing was a new one, hired by his mother before it was painted, to go to Salem to market; and he went for the first time with her, she having been previously accustomed to go to market on horseback. Among other things carried to market at this time were some checkered handkerchiefs of her own manufacture for the soldiers in the service of the war of 1812.

From the above and our own recollection, wagons were not much used until about that time, — 1812 or 1813.

The Sawyer apple originated in Methuen, on the bank of the Merrimack, and on the farm of the late Aaron Sawyer, which gave name to the fruit, the origin of which will date back, probably, as far as those above named. There was an important and protracted trial, at which we were present, between Mr. Sawyer and the Essex Company, about the value of this tree, which was then in a decayed state, and would have soon been likely to die a natural death. The Essex Company, by building their dam at Lawrence, flowed the land where the tree stood; and large damage was claimed for its value. Many witnesses were called, and much time was consumed, to prove the large amount of valuable apples it had previously produced, and consequently the great value of the tree. We have no doubt, from the amount of the award of the referees, that it had considerable influence in their decision. The tree, we suppose, was unusually large, a prolific bearer, and of superior autumn fruit. It now appears, from those that were grafted from it within our knowledge, that the fruit is depreciating, like other varieties of about the same age.

The Runnels apples, or Iron apples as they are sometimes called, were formerly prolific bearers, and were considered profitable apples to cultivate. Their value consisted in their late-keeping and good cooking qualities; but they were not good for the table.

We remember, many years ago, being on the farm of the late John Barker of North Andover, who was then known to be famous for his late-keeping winter apples, and his care of keeping and marketing them.

A tree was pointed out to us, of the Runnels variety, from which it was said that he got fifty dollars for a one horse load carried to Boston. He carried twenty-five bushels, and sold them for two dollars per bushel. Whether the twenty-five bushels were all the tree produced, we were not informed.

The Currier apples originated in our neighborhood, probably within the present century, and on the farm of a Mr. Currier, which gave name to the apple. They are juicy, of good flavor; in form like the Porter apple, but not quite as large; a little striped with red; and will keep longer than the Baldwin; and the tree is an uncommonly great bearer.

We were informed by Mr. Gordon, the present owner, that he picked from the original tree in one year, about twelve years ago, seventeen barrels, which he sold in the winter or spring for five dollars and a half per barrel at the cellar, amounting to the handsome sum of ninety-three dollars and a half, not including the apples that dropped from the tree. A few years previous to this time, there were said to be gathered from the tree twenty-eight barrels at one time, not including those that dropped from the tree.

As to the price for which they were sold, we were not informed. They have been grafted, to some extent, in our vicinity; and a neighbor who had a large orchard of mostly Baldwins said to us, that, if his orchard had borne Currier apples instead of Baldwins, it would have given a much larger income in the last few years than it has. The reason he assigned was, they have often produced a good crop when the Baldwins have failed; and, as they keep better than the Baldwins, they usually bear about the same price.

The President apple originated in Pelham, N.H., within the present century, — an excellent fall apple, and good bearer.

The Hubbardston Nonesuch — we know not when or where it originated — is a prolific bearer, of superior quality; suitable for use in late fall and early winter.

As to the origin of the Baldwin apple, we have the following information from the Hon. Josiah Newhall of Lynnfield. The Baldwin apple, he says, was found growing wild in the town of Wilmington, on the farm of a Mr. Butters, more than a hundred years ago. It was known as the Butters apples, also known as the Woodpecker apple, the woodpecker having perforated the bark. Being disseminated by Col. Baldwin, they were called the Baldwin apple. For many years the Baldwin apple, we think, has been more extensively cultivated in this county than any other winter apple, if not more than all other winter apples put together; and its good qualities are such and so well known, that no recommendation is necessary.

The best apples are not always the most profitable. We have many times had apples highly recommended, have grafted them, and, when they came into bearing, have grafted them over again in consequence of their being unproductive, and not so profitable as other varieties.

Some varieties produce better fruit in some localities than in others. Better Roxbury Russets are produced near the seashore than in the north part of the county; although they are, in our opinion, far inferior to what they were sixty or seventy years ago. The Rhode-Island Greening has greatly deteriorated with us, but is said to do well in some other places. The same may be said of the Hunt Russet.

The Northern Spy is said to be a late-keeping winter apple. It is a good apple, but with us not profitable to cultivate. On some trees the apples rot; on other trees they are of inferior quality.

In a letter received from Gen. Newhall, he says the English Pearmain was brought to this country by the early settlers. In his early life he set out several trees of that variety, which produced fruit for a few years; then the fruit began to decline, and became worthless. He also mentions the Russet Pearmain, Codlin, Cat's-head, Redstreak, &c.; which were popular apples one hundred years ago, but are now worthless.

He further says he believes the apple-tree is no exception to the law of nature in regard to every living thing, which has its youth, maturity, and decline. From our own experience and observation we fully agree with our venerable friend; and we think the opinion he has formed from his long experience should have weight. If it is a fact that apples deteriorate in quantity and quality, as we think they do, then it will be a great blessing to posterity if new varieties can be procured of superior quality, particularly of late-keeping winter apples, as we think we are most deficient in that class of fruit. The apple-crop is of immense value, not only as a luxury, but as a necessary healthful food; and the fruit continues fresh nearly the whole year. If a new variety of apples can be obtained like the Roxbury Russet of seventy years ago, — the fruit large and fair, rich and juicy, a prolific bearer, which would come into the market after the Baldwin in late spring and early summer, — it would be of great value; so would a variety to take the place of the Baldwin, should it decline as other varieties have done.

Several years ago we sowed a small nursery, nearly all from the seed of the Baldwin apple. Being desirous, if possible, of procuring a new and valuable variety of fruit,

we selected about one hundred of the most thrifty, stocky, broad-leaved trees, the most of which were removed to the field for an orchard, the others remained in the nursery, — all to remain ungrafted until they bore fruit. In due time they all produced fruit. What was the result? There was not a Baldwin, nor any one like a Baldwin; but all were greatly inferior to the various varieties that we now have. From the above experiment, and as nearly all the young trees that are transplanted are budded or grafted before bearing, how can we procure new varieties of superior fruit? From the aforesaid history of the Baldwin apples, and the knowledge that we have of their being disseminated over the community, we think they must have remained in obscurity for many years, with their great value concealed from public view.

Is it not possible that there may be a tree in some retired place equal to the Baldwin, or to what the Roxbury Russet formerly was, which a large premium would bring to public notice? Or may it not be possible that a superior quality of late-keeping winter apples may be found in our markets, which a large premium would lead some one to trace to their origin, and, if worthy, procure grafts therefrom?

There are many enemies of the apple to contend with, which we think are worse than those above named. We mean the insects in the tree and in the apple. They are not, in some respects, unlike some of the human species. They work in the dark, and cannot be effectually met. The canker-worm and caterpillar can, with care and labor, be destroyed. But what can we do with the borer? One says, Dig him out: another says, We wash the trees, and destroy the eggs. This may be done, to some extent, in small orchards of young trees; but to destroy them in large orchards of large trees is much easier said than done. We believe the borer is doing much more damage in our orchards than is generally supposed. He not only perforates the body of the tree, but the branches also, which causes premature decay.

There are now many difficulties to contend with that did not formerly exist. The canker-worm and caterpillar existed then as now. The canker-worm ravaged the orchards in the latter part of the last century, and was killed by a late frost, and the apples were also killed at the same time; and it was

said that the loss of the apples was not considered a calamity, as the destruction of the worms more than balanced the loss of the apples. They appeared again in the early part of the present century. Many remedies were applied for their destruction; but nothing proved effectual, except tarring the trees. We well remember assisting in tarring our father's trees. The custom then was to mix blubber with the tar, heat it, and apply it warm every day, late in the afternoon, which proved effectual. We think if ink were applied every day, as we then applied tar, it would be more effectual, as we have seen the insects passing over the ink the second evening without trouble.

We think the destruction of birds has had much to do with the increase of insects, as many kinds of birds live mostly on them.

How to prevent the depredation of the apple-worm is a difficult subject to determine. Sometimes they are very injurious to the fruit; other seasons we get a good crop, nearly perfect. The cause of the change is hard for us to understand.

Atmospheric influences sometimes operate on the crop. The year 1874, it will be recollected, was an apple-year, particularly for the Baldwin. The crop was generally large, and the price of apples low. In our locality there was a large blossom, which looked healthy and strong. When in full bloom, a blight came over the trees, which gave the blossom and foliage an unhealthy appearance. Many of the leaves curled up and dropped off; and many of the trees did not recover from the shock during the season. There was a small crop of apples of very inferior quality. Some orchards not far distant had a full crop of good fruit. In 1876 some of the orchards that failed two years before produced a full crop of nearly perfect fruit, with few wormy apples.

The present year there is almost a total failure. We are aware that a great crop of Baldwins could not be reasonably expected. There were, however, some orchards that blossomed tolerably well. What was the cause of the failure? It was not the canker-worm nor caterpillar; for in many of our orchards there were none.

It was said by one of old, "Except the Lord build the house, they labor in vain that build it; except the Lord keep

the city, the watchman waketh but in vain." Although we may cultivate our orchards well, and protect them as well as possible against insects, yet, without the smile of Him who rules the elements, our crops may fail.

Now, in closing, we would recommend to those who have good orchards, to cultivate and protect them as well as possible against insects, and we trust in most cases they will, with the blessing of a kind Providence, be rewarded.

JOSEPH HOW, *Chairman.*

ESSEX.

ASSORTED FRUITS.

[From the Report of the Committee.]

We congratulate the society on the decided step in advance which has been made this year in the arrangement of fruit in our hall of exhibition; that is, of having *each variety* by itself, and not scattered promiscuously on several tables, as has formerly been the case. It has in former years been impossible for any fruit committee to do justice to the exhibitors; and this year we find many of the exhibitors themselves decidedly opposed to this "new arrangement," especially those who had for many years been in the habit of heaping all their fruit together, thus aiming more for a large "collection" than for more choice specimens of fewer and better varieties. We trust that in future this plan will be more perfectly carried out, and that all the contributors will see the propriety of the new method.

The display of grapes this year was very fine indeed; and the neat arrangement of the tables was a credit to those who had charge in this department.

This year has been a favorable one for the grape in all this vicinity, as it always does best in a dry, warm season, without any hinderance from early frosts: hence we should plant the grape only in the driest and earliest locations. Even in Western New York and Ohio, where the climate is much more favorable for this fruit than here, experience has proved that grapes can only be grown with any amount of

certainty upon the rockiest and driest hillsides. Again: we think that experience has proved to us, that only the most hardy vines of our purely native species (the Labrusca) can be depended upon for a term of years. This may not be the decision of the whole committee; for we know that many still adhere firmly to the Rogers and other hybrids; but those of us who have for years made the growing and testing of vines a business are careful not to invest largely in any grape of foreign parentage; and, when any new grape presents itself as the "best yet introduced," the first inquiry should be, Does it inherit foreign blood from either of its parents? If so, it will most likely inherit a feeble constitution, followed by mildew and an early death. Careful cultivators may and often do succeed for years with these high-blooded grapes; but they require constant watchfulness, and a good covering every winter is indispensable.

We would not by these remarks discourage any from raising this, one of the most healthful and delicious of all fruits, but would rather encourage every one whose circumstances will permit, to do it intelligently, — to select none but the most approved hardy varieties, and plant and cultivate as experience has proved best for this locality. The discouragements which seemed to hang over us a few years ago, in the shape of blight and mildew, have, in a great measure, passed away; and we can but hope that a "new era in grape-culture" is about to dawn upon us.

There are but few peaches presented this year; the crop having been very nearly a failure; and only the latest ones could be kept for this exhibition. This crop, which is generally considered uncertain in New England, has, for several years past, been a partial success, especially in certain high, dry locations in this vicinity, where an entire failure has not occurred for something over twenty years before. Just warmth enough to swell the fruit-buds at a certain time during winter, and then a sudden freeze afterwards, was evidently the sole cause of this failure, as the trees never looked more healthy and promising than in the autumn before.

This fall again we have reason to take courage, and hope for the best, and trust that at some future time, when we have learned more fully the requirements of the peach, we shall be blessed with plentiful crops, as of old. We would

suggest to novices, however, who design to plant peach-trees, that they require a dry soil, thoroughly cultivated, but no animal manure of any kind, but rather muck, and especially potash in liberal quantities. The aim should be, not to produce a late growth, but healthy, well-ripened wood, which is the only kind that will endure our winters. Trim out all dead and sickly wood every year about the first of June. Plant hardy and rather early varieties. Many kinds recommended by nursery agents are too late, and will not ripen at all in this latitude. For orchard-culture, do not plant too thickly: sixteen or eighteen feet is near enough. Training upon fences, and pegging down branches to be covered in winter, is very pretty amusement for the amateur; and orchard-house culture, for those who can afford it, is very pretty and sometimes profitable.

One other fruit is worthy of remembrance, which we formerly raised in great abundance in this county, but which now we never see upon our exhibition-tables, namely, the plum. Why should this fine fruit be wholly abandoned, as long as it has been fully proved that its two greatest enemies — the curculio and the black-knot — can be successfully dealt with? Then we have new but coarse varieties, that are hardly affected by these enemies at all, and which, even for cooking-purposes, would well repay the trouble of raising. We sincerely hope we shall see the time when this fine old fruit will be cultivated to some extent, if we do not have it in its former abundance.

T. C. THURLOW, *Chairman.*

NANTUCKET.

[From the Report of the Committee.]

More fruit is annually being produced, and the demand is increasing. Once a nursery of twenty acres was considered large; now we find them of several hundred acres.

Fruit has become the regular diet of many families: it has been found by experience to be an agreeable and healthy food. It consists mainly of water, with variable quantities of starch, sugar, and gum. Many kinds furnish a fair supply

of gluten, and are on that account highly nutritious. Their chief value, however, as diet, is in the various forms of vegetable acid which they contain in such combinations with the alkaline and earthy carbonates as supply an important want in the process of digestion, as well as furnish the lime and potash which they contain for the use of the animal economy.

The soil and climate of our county may not be as well adapted to some branches of fruit-growing as that of many other localities. What Nature has failed to do for us, we can accomplish by enterprising expedients; and our market-values compensate, to some extent, for these local obstacles. Our glazed houses will protect our fruit from bleak winds in our cool climate, and enable us to raise the richest of tropical fruits; and our nurseries can be sheltered by stone and wooden walls from northerly winds, leaving only sunny exposures. The importations of fruit to our State amount in value to thousands of dollars. It is a problem in political economy which calls for intelligent consideration to supply this demand.

Apples can be used in so many ways, that they have become almost an indispensable article in our household. The large number of specimens seen in many of our county fairs shows conclusively that they can with care, be raised successfully in our State. Trees, like field-crops, require and must have, constant care, and should not be allowed everywhere, without reference to the quality of the soil. Shelter is a matter of great importance, not only to this fruit, but more especially to pears and less hardy trees. Having secured a proper location and soil, it is better to cultivate the ground at least one year before setting out the trees. Apple-trees require attention: every year they should be pruned, and protected from the ravages of insects. Some authorities advise planting these trees twenty-five feet apart, and not allowing the limbs to lie on the ground. Pears can be raised as easily as apples, with as sure a crop, and will pay a profit. These trees seem to flourish on heavy clay and loam, and require to be well manured: they will bear planting much nearer than apples; in fact, about double the number should be planted on an acre.

The grape is a fruit which has received attention from the earliest periods of civilization to the present date, and in

nearly every clime: it has always been a favorite fruit wherever cultivated. We look over our country, from the shores of the Atlantic to the Pacific States and Territories, and behold thousands of acres of luxuriant vineyards, until we reach the Golden State, where the rich purple fruitage of the valleys vies with the vineyards of Southern France and Italy. Grapes require rather a gravelly loam or clayey soil, a little manure (and that well decomposed), or ashes, or bone-dust. A great deal depends upon location and treatment: they require a southern slope, with good shelter, and protection from northerly winds.

The strawberry, among the so-called small fruits, is of great importance: it is very rich and delicious; and the increasing supply of this article from thousands of acres in this State, and car-loads on car-loads from others, has reduced the prices so low, that they comport with the means of the poorest consumers. This healthful fruit is easily grown; yet there are farmers who have abundance of land, and to spare, who seldom, if ever, have it upon their tables. Strawberries require a good rich soil, not too low or wet, well prepared by deep ploughing and very heavy manuring. From three thousand to four thousand quarts can be raised per acre, if the season is favorable, at an income of from one thousand to fifteen hundred dollars.

Blackberries are entitled to great consideration, especially in this county, where we import annually such large quantities of this berry and the whortleberry. It has been estimated that from three thousand to four thousand dollars are annually paid here for these fruits. The Lawton variety thrives well in our county: a strong, but not wet soil is better adapted to this fruit than a light, sandy one. The vines should be set about five feet apart, well pruned by removal annually of the dead wood, and with care can be made to pay as much per acre as any other product raised here, having an excellent home-market.

Next in our list of berries is the cranberry: we had excellent specimens on exhibition at our fair, that showed improved quality by careful cultivation. Without doubt cranberries will pay well for culture.

We have hastily penned a few thoughts on the culture of the most prominent fruits raised in our State; and the ques-

tion is forced upon us, "Does the raising of fruit pay?" We answer, "Yes, in more respects than one." It can be made to pay, with due knowledge and attention, as much per acre as vegetables, cereals, or other crops pay; and it tends to develop our better natures, to cultivate our taste, and to add to the comfort of our homes by enabling us to sit under our own vines and fruit-trees. Mentally it furnishes the proper nutriment and brain-food for a healthful and hygienic activity of that organ, being a rational substitute for indigestible irritants and highly-seasoned condiments, which produce that feverish excitement that attends their digestion. We may reasonably hope that the day is not far distant when fruit in every form will be upon our tables as a dessert in lieu of that indigestible and innutritious pastry.

ALEX. MACY, JUN., *Chairman.*

INDIAN CORN.

ESSEX.

[From the Report of the Committee.]

The committee were notified to view the corn-crop of George L. Flook, West Newbury; and accordingly, on the 15th of October, three members met at Mr. Flook's farm, on old "Crane-neck Hill," and proceeded at once to the duty assigned them.

We found a field of nearly three acres of excellent corn, growing upon a gravelly soil, on the south-easterly slope of the hill. One acre of this field was entered for the premium. Mr. Flook stated that the land was broken up last spring, and upon one half-acre a compost of hen-manure and barn-yard scrapings, valued at ten dollars, was spread broadcast, and harrowed in. The other half-acre was treated with ten dollars' worth of the Stockbridge Fertilizer, in the same manner. A few rows adjoining received a dressing of ashes. Here the difference was plainly visible, and showed greatly to the disadvantage of the ashes; for not only was the crop very much smaller, but the quality of the corn was also inferior to that raised upon either the compost or the Stockbridge Formula.

The corn was tarred, to prevent the depredations of the birds, and planted in checks three feet and a half apart each way, care being taken never to exceed six kernels to the hill. It should be stated that the compost was applied to the lower, and the Stockbridge Formula to the upper, and consequently earlier and drier end.

Your committee selected one rod, an average, from both the lower and upper ends, husked and weighed the corn, remarking that the crop on the upper end was filled out better, and was also drier.

The corn raised upon one rod, with the Stockbridge Formula, weighed fifty-nine pounds and a half. The corn raised upon one rod, with the hen-manure compost, weighed fifty-nine pounds.

The society's standard has been from seventy-two to eighty pounds to the bushel. This would give in the one case over a hundred and thirty-one bushels, and in the other over a hundred and eighteen bushels of shelled merchantable corn per acre, — an unprecedented crop. We were not satisfied with this result; and, believing that it requires more than eighty pounds of corn on the ear to the bushel, we determined to test the matter thoroughly. Mr. Flook, entering earnestly into the question, hung the corn over the kitchen stove, where it remained two weeks drying. At the request of Messrs. Ordway and Day, I examined and again weighed the corn on the day it was shelled, Oct. 29; and the result proves what your committee expected it would, — the corn was dry, hard, flinty, and fit to grind.

The shelled corn raised upon one rod, with Stockbridge Formula, weighed thirty-six pounds and three-quarters (a shrinkage of twenty-two pounds and three-quarters), a hundred and five bushels per acre.

The shelled corn raised on one rod with hen-manure compost weighed thirty-six pounds (a shrinkage of twenty-three pounds), a hundred and two bushels and six-sevenths per acre, making Mr. Flook's *actual crop* nearly a hundred and four bushels per acre, instead of a hundred and thirty-one bushels, as tested by the standard of seventy-two pounds per bushel. It will be seen that the shrinkage from the gross weight when harvested, to the net weight when merchantable, is nearly forty per cent; and we hope our trustees will hereafter make the standard ninety pounds per bushel.

When we take into consideration the enormous amount of corn exported in 1876 (50,910,532 bushels, nearly seventy per cent greater than the previous year, and also the fact that New Hampshire last year raised 2,029,000 bushels of corn, and Massachusetts only 1,150,000), would it not be well for the old Essex Society to endeavor to increase this all-important crop by offering *more* than one premium for corn?

HORACE F. LONGFELLOW, *Chairman.*

[Statement of G. L. Flook.]

The crop of 1875 and 1876 was grass. The nature of the soil was gravelly, low: it was broken up in the spring of 1877, being ploughed to the depth of eight inches. I spread on about ten dollars' worth of Stockbridge manure, and about ten dollars' worth composted of hen manure and barnyard. The cost of planting, harrowing, and ploughing, was seven dollars; the amount of seed, one peck of eight-rowed yellow corn, worth twenty-five cents: it was cultivated twice, and hoed three times. The cost of cultivation, ten dollars; and the cost of harvesting, eleven dollars and a quarter. The fodder I estimate as worth twenty dollars. The crop was a hundred and four bushels.

[Statement of J. J. H. Gregory.]

Previous to 1875 the land was in grass, and had been for many years. In 1875 it was broken up, being at the time badly run out. The crop of that year was Drumhead cabbages; the ground being well manured with glue-waste and leached ashes broadcast, with ground bone and hen-manure in the hills. The crop of 1876 was potatoes, which received a liberal manuring with fish-waste, glue-waste, potash, and superphosphate, — the two latter in the drills. It was ploughed, both last fall and spring, about seven inches deep. Previous to the spring ploughing, eight cords — half of barn-manure and half a compost of waste-fish and soil at the rate of one part of fish to three of soil — were spread broadcast. Four hundred and fifty pounds of muriate of potash were harrowed in, and seven hundred and fifty pounds of the pomace of the castor-oil bean were scattered in the drills. The drills were made three feet and a half apart, and the corn dropped a foot between the kernels.

The entire cost of preparing the ground, and planting, was about twelve dollars. Cost of the manure: barn-manure, thirty-two dollars; fish-waste, fifteen dollars; muriate of potash, twelve dollars; bean-pomace, seven dollars. The corn was planted May 15; but, owing to devastation from

the crows, a considerable portion of it had to be replanted at various intervals up to the middle of June, which, as every farmer knows, is unfavorable to the crop; the late planted not yielding as well; that first planted overgrowing and overshadowing it. The variety was a new kind, named the the "Compton," originated by Mr. Compton of Pennsylvania by planting the abnormal ears, which sometimes grow in place of the spindle. The seed for the acre cost about five dollars, and the planting of it two dollars. The corn was cultivated four times, at a cost of five dollars, and hoed and weeded at an additional expense of five dollars. It required no thinning. Owing to great press of other work, it was not harvested until the close of October, having suffered considerably from the depredations of crows and rats. In September it was topped, and the stover secured in good condition. The cost of gathering and husking was ten dollars.

The yield of the acre was two hundred and two bushels of ears, of which only twelve were inferior in size and quality, the remainder making the handsomest lot of ears I ever saw grown on an acre of ground: they were remarkably large, many of them being twelve and fourteen rowed, and were almost uniformly filled out to the tips. Many of the stalks had three good sized ears on them. Some of the ears were glazed in seventy days from the date of planting. The stalks were quite tall, and suckered freely, making the stover of more than ordinary value. Large as was my crop, it was much below that for which Mr. Compton was awarded the Conrad Wilson prize by a committee of intelligent gentlemen. An objection to the Compton Corn is the size of the cob, which is a partial offset to the size of the ear, and to its habit of filling out to the butt, its earliness, and productiveness.

It will be seen that the cost of the acre of corn, charging, as customary, one-half the cost of the manure to the crop, was sixty-nine dollars. At eighty-seven cents a bushel for Northern corn, the value of the crop would be eighty-seven dollars. If to this twenty-five dollars is added for the value of the stalks, which abounded in suckers, and were unusually tall, the value of the crop would be a hundred and twelve dollars.

MIDDLESEX SOUTH.

[Statement of P. McMahon.]

The field of corn which I have entered for premium contains about five acres. The nature of the soil is brackish, with a yellow clay subsoil. It was in mowing five years; then ploughed last April, six inches deep, and manured from the barn-cellar at the rate of ten cords per acre, first quality. It was planted May 18 and 19, cultivated three times, hoed twice, and thinned once to three and four in a hill. Distance, three feet and a half apart each way.

I previously valued my manure at eight dollars per cord; but, as all prices are lower, I think six dollars per cord a fair price.

Value of crop, 125 bushels to the acre, amounting to 625 bushels, at 80 cents per bushel	$500 00	
Five-eighths value of manure	168 75	
Value of top stalks	25 00	
Husks for the harvesting		
		$693 75
Expense of ploughing	$20 00	
Carting manure	30 00	
Spreading manure	6 00	
Harrowing	6 00	
Furrowing	4 00	
Planting	7 00	
Seed	1 25	
Cultivating three times	9 00	
Hoeing twice	15 00	
Thinning	3 00	
Cutting and taking off tops	10 00	
Fifty cords manure at $6 per cord	300 00	
475 pounds Bradley's superphosphate, in the hill	10 68	
		421 93
Net income		$271 82

SOUTHBOROUTH, Oct. 4, 1877.

[Statement of J. D. Hunt.]

My crop of corn was raised on four-fifths of an acre in Milford.

I took a hay-crop in 1875 and 1876. No manure was applied either year. The soil is a black loam, with clay or hard bottom. It was ploughed the first time May 5, 1877, then a greensward. It was harrowed about the 15th of May, and ploughed again the 20th of May, then harrowed again on the 24th of May.

The ground was ploughed about six inches deep, furrowed both ways about three feet six inches apart, and planted in hills the 29th of May.

Cost of ploughing twice	$6 00
Cost of harrowing twice, at $1.50	3 00
Cost of furrowing	1 50
Three cords and a half of manure, at $8	28 00
Six quarts of seed-corn	36
Cost of planting, for man two days	4 00
Cost of ploughing once each	2 00
Cost of hoeing first time	2 50
Cost of hoeing second time	2 50
Total	$49 86

The crop was harvested Oct. 20. There were a hundred and ninety-eight pounds of ears on four square rods, or eighty-eight bushels of shell corn on the piece of a hundred and twenty-eight rods, forty-nine pounds and a half of ears to the rod.

Harvesting	$3 00
Husking	3 25

Making a total cost of $56.11.

FRANKLIN.

[Statement of I. W. Barnard & Son, Shelburne.]

In 1875 the land was manured with ten ox-loads (of what, the report does not tell), and planted with corn and potatoes. The next year six ox-loads of manure were used; and the crop was potatoes. The soil, which is gravelly loam, was ploughed once in 1877, seven inches deep, and thoroughly harrowed, at a cost of three dollars. Nineteen loads, of thirty bushels each, of stable-manure, were spread and ploughed

in, and two hundred and fifty pounds of Enoch Coe's phosphate were added, a tablespoonful being placed in each hill. About the middle of May, six quarts of eight-rowed yellow corn were planted. This crop was cultivated with a horse, and hoed three times, and thinned to four stalks in a hill. In the early part of September the stalks were cut at the roots, and two or three weeks after the corn was husked and stored.

By measurement in three different parts of the field, the yield of corn was found to average forty-six pounds to a square rod, or 7,360 pounds to an acre.

Cr.

By 113½ bushels corn, at 75 cents	$85 12	
Two tons stover	18 00	
		$103 12

Dr.

To preparation	$3 00	
Manure	31 66	
Phosphate	6 25	
Seed and planting	2 50	
Cultivation	6 00	
Harvesting	6 00	
		55 41
Profit		$47 71

[Statement of Edwin C. Parker, South Deerfield.]

The land on which this crop of corn was raised had been seeded down three years. The soil, which is a light loam resting on a clay subsoil, was ploughed in the fall eight inches deep. Twenty loads of manure of thirty bushels each were spread broadcast on the furrows, and pulverized and worked in with a wheel-harrow. The land was planted on the 15th and 16th of May, with a twelve-rowed variety of corn in furrows three feet apart, and in hills three feet and a half apart. Ten bushels of ashes were placed in the hills. The crop was cultivated three times with a horse, and hoed once by hand. The harvesting was begun Sept. 3, and the crop was gathered into stooks of thirty-six hills each, and the stooks tied around the top.

Mr. Parker says, "In planting corn I have found, that, the

nearer it is in the hill, the better the crop. I cultivate as level as I can, not making hills. It stands drought better, and I think that I get more corn."

Cr.

By 108⅔ bushels corn, at 75 cents	$81 50	
Two tons stover	16 00	
		$97 50

Dr.

To ploughing	$2 00	
Manure	41 00	
Seed and planting	2 40	
Cultivation	4 00	
Harvesting	6 00	
		55 80
Profit		$41 70

Profit, estimating that half of manure remains for next crop, $62.40.

HINGHAM.

[Statement of Edmund Hersey.]

I submit the following statement of an experiment made on two acres of land planted with Indian corn, not for a premium, but that it may reach our society through the proper committee.

The land selected for the trial was a poor, sandy loam, the subsoil being good mason's sand. For the last thirty years the land has been pastured with cows. It was ploughed the second week in May, and planted the third week, with the variety known as long-eared, eight-rowed yellow. The hills were three feet and a half apart each way; and five kernels were put in a hill. The 11th of July, the corn was ploughed crosswise, two furrows in each row, turning from the corn. No hoeing was done at this ploughing, except to cut down a few briers. June 18 it was ploughed lengthwise, two furrows in a row, and again turned from the corn. One hour only was spent with the hoe this time. Nothing more was done till July 4, when a cultivator was run through lengthwise, and the ground made as level as possible with the hoe. Nothing more was done by way of culti-

vation, yet the field was very free from grass and weeds during the whole season.

Two experiments were tried: first, to ascertain if corn can be grown at a profit in this locality; second, to test the value of the Stockbridge Fertilizer as compared with stable-manure at seven dollars a cord delivered. I had a good opportunity to test the first; for I bought most of the manure, and hired the principal part of the labor. In regard to the second, I took two strips across the lot, in places where the land was of no more than an average quality, and measured it accurately. I know of no way to make a better experiment.

The following is the result on an acre and three-fourths manured with good stable-manure at the rate of five cords to the acre:—

EXPENSES.

Ploughing	$7 00	
Manure	61 25	
Spreading	2 50	
Harrowing	1 75	
Furrowing	1 75	
Seed	87	
Planting	3 50	
Ploughing	3 50	
Ploughing	2 62	
Cultivating	1 54	
Hoeing	7 00	
Topping	7 00	
Harvesting	5 25	
Husking	8 38	
		$113 91

RECEIPTS.

Corn fodder	44 50
Cost of corn	$69 41

The product of the field was a hundred and fourteen bushels (by weight), making a cost per bushel of a fraction less than sixty-one cents, without estimating any thing for improvement of land.

One-fourth of an acre was manured with the Stockbridge Fertilizer, with the following result:—

EXPENSES.

Ploughing	$1 00	
Fertilizer	6 00	
Harrowing	25	
Furrowing	25	
Planting	50	
Seed	13	
Ploughing	50	
Ploughing	38	
Cultivating	22	
Hoeing	1 00	
Topping	1 00	
Harvesting	75	
Husking	1 18	
		$13 16

RECEIPTS.

Corn fodder	5 50
Cost of 15½ bushels of corn	$7 66

Cost per bushel a fraction less than fifty cents.

HINGHAM, Dec. 1, 1877.

WHEAT.

FRANKLIN.

[Statement of Miron Brown, Sunderland.]

The quantity of ground on which this crop was raised is two acres. It was in grass in 1875. In 1876 about sixteen cords of barnyard-manure were used on the whole piece, which was ploughed six to eight inches deep; and the crop for that year was tobacco. Preparatory to sowing, the land was cultivated twice with wheel-harrow; and Sept. 15 two bushels per acre of white wheat were sown broadcast, and harrowed in with a common harrow. The crop was harvested July 25, cut with a common cradle, and bound in sheaves the usual way.

Mr. Brown says, "I had wheat on these two acres in 1873: at that time I applied a hundred and fifty bushels good unslacked lime, and harvested sixty bushels of wheat. My opinion is, that the lime did not benefit that crop, but has been of great service to every crop since; and the present wheat-crop owes a good deal to that lime." Soil a clay loam.

Cr.

By ninety bushels wheat from two acres	$135 00	
Three tons of straw	30 00	
		$165 00

Dr.

To ploughing, and other preparation	$4 00	
Seed, and planting two acres	12 00	
Harvesting	20 00	
		36 00
Profit		$129 00

FRANKLIN.

[Statement of E. A. Hawks, Deerfield.]

The piece of land on which this crop was raised contains two acres and thirty-three rods. The crop of 1875 was cucumbers, for which stable-manure was used, at the rate of six loads to the acre in the hill. The next year nine hundred pounds to the acre of fish-guano was spread on the soil, and harrowed in, and the crop was corn. This year no manure was used. The land was ploughed once, April 16, seven inches deep.

The cost of harvesting and threshing was increased by the fact that a third of the crop was badly lodged. The entire expense of seed, manure, labor, and cultivation, was $28.85. The value of the products — a hundred and sixty-seven bushels of oats, and straw estimated at a ton and a half to the acre — was $118.50.

[Statement of Edward H. Fisk, Shelburne.]

In 1875 no manure was used upon the land; and the crop was buckwheat. The crop of 1875 was corn; for which twenty-five loads, of thirty bushels each, of barnyard-manure, were used. The soil, which is a sandy loam, was ploughed once seven inches deep, and thoroughly harrowed.

Cr.

By seventy-five bushels oats, at 55 cents	$41 25	
Two tons straw, at $15	30 00	
		$71 25

Dr.

To ploughing, and other preparations	$5 00	
Twenty-five loads of manure	25 00	
Four bushels seed, at 75 cents	3 00	
Sowing	3 00	
Harvesting	6 00	
		42 00
Profit		$29 25

RYE.

PLYMOUTH.

[Statement of James Howard of West Bridgewater.]

The lot, containing one hundred and sixty-eight rods, on which my rye grew the present year, is very uneven, both in surface and in the quality of the soil; varying from a loose, sandy hill-soil on one side, to a low, dark loam on the other. In corn in 1875, manured with four cords of compost; and in potatoes in 1876, manured with four cords of stable-manure, ploughed in, and with a compost of bone and potash in the hill. In September, 1876, it was ploughed about five inches deep; four hundred pounds of ground bone mixed with four barrels of wood-ashes, spread on and harrowed in, and sown to rye, using seven pecks of seed. In April, 1877, one bag of Stockbridge manure was sown on the piece. Harvested July 10. When threshed, there were 5,680 pounds of straw, and 2,246¼ pounds of rye, being at the rate of thirty-eight bushels and one-fifth per acre. My cows accidentally got into my rye twice, injuring it, I think, about two bushels. Expenses: ploughing, &c., three dollars; manure, nineteen dollars; seed and sowing, four dollars; harvesting, seventeen dollars and a half: total, forty-three dollars and a half.

[Statement of Edward White of Marshfield.]

The crop of rye that Mr. White offers in competition for a premium was grown upon one acre of the central portion of the diked marsh-land on Green Harbor River. It was in rye in 1876, and again sown in September for this crop, using one bushel of seed. It was ploughed about six inches deep, and harrowed twice each year. No manure or fertilizer has

been applied. It was mowed in September. When threshed, it yielded by weight 1,708 pounds, or thirty bushels and a half of rye, and 3,097 pounds of straw. Expenses: ploughing and harrowing, seven dollars; seed and sowing, four dollars; harvesting, ten dollars: total, twenty-one dollars.

Mr. White says, "The experiments on the Green Harbor marsh have been very successful, and are worthy the serious consideration of all persons owning lands of similar character on the coast. The failures have been exceptional, and are such as might occur on any lands not fairly drained, and fitted by the action of the elements for perfect results. In this crop the rye was very heavy, a measured bushel weighing sixty pounds. In consequence of a severe storm just before harvest, it was estimated that five bushels were lost."

FIELD AND GARDEN CROPS.

MARSHFIELD.

[From the Report of the Committee.]

If we had never wished to fill our cellars with fruits and vegetables raised by our own hands, we think the desire would have been created by visiting this department the present season. Improvement every year has been our object. A new and prominent feature has been the increase of field-corn over previous years. This cereal has appeared on our tables, of excellent quality, and grown in quantity at the rate of a hundred and seven to a hundred and twelve bushels per acre. This gives us all a feeling of encouragement. "With plenty of corn and hay we can have things pretty much our own way," said the old farmer. It will pay us to cultivate corn, if we feed our crops. It sells well on the farm, and there is no fear of decay, if it is cured with care.

Your committee report a large variety of vegetables, comprising squashes, beets, turnips, and potatoes in great variety. If these productions cannot be sold at remunerative prices, they are valuable to the farmer to feed to stock; and he can grind them into milk and meat and chickens and eggs *ad infinitum*, thus keeping the wolf from the door in a period of great commercial depression. Learn, then, to feed your crops, if you would be fed. Give, and you shall receive, is the law. Heavy crops of onions have been raised on sandy soil, by extra care, and an application of ashes at the rate of forty barrels to the acre. The same general rule applies to strawberries and most of the early crops.

In addition to the usual variety was a table covered with the productions of the new soil on Green Harbor marsh. Heavy oats and rye and barley, and *all* the vegetables that were grown there, were of good quality, and grown without

special fertilizers: in fact, where manure has been applied, there has been no apparent benefit. Some idea of the productive quality of these lands may be formed, when we consider the depth of soil, which ranges from six to ten feet, — a great deposit from the ocean of exceeding value to the farmer. Mr. Ware of Marblehead mentions the fact of seventy-three tons of mangel-wurzel produced to the acre upon sea-manure alone. The mangel has done well on the new soil, likewise strawberries, which seem to thrive near the borders of our marshes.

A firmer faith in the capacity and value of the soil is the need of the hour, and will give to our youth that character which is sure to come by patience and perseverance. We do not hear the discouraging word uttered, without recalling an interview with an intelligent man from New York, whose grandfather conceived the idea of reclaiming a tract of land larger than Green Harbor marsh; going to work with courage, he cleared off the bushes and trees, opened drains at considerable expense, letting in light, receiving much in return, though not enough to pay the expenses. The property passed into the hands of a relative, who, with commendable spirit, prosecuted the work already begun. "Let us have more light," said he. "Does this property pay now?" we asked. "Yes: the net profit is ten thousand dollars every year." We suppose this land to be very fertile, as more than fifty head of cattle are kept on the domain. But the dollars, so very tempting, are not all the benefit derived from improvements. Farming is the study of Nature in all her infinite varieties, from the first box of strawberries to the late harvest; through the frosts of winter the care of our domestic animals, and the inspiring thought of the early spring.

G. J. PETERSON, *Chairman.*

MIDDLESEX SOUTH.

SQUASHES.

[Statement of L. and G. W. Chadwick.]

The land is one-eighth of an acre. The soil a dark loam; in grass in 1874 and 1875; in potatoes, 1876. It was ploughed

June 10. I spread on a cord and a half of compost-manure from the barn-cellar, harrowing very thoroughly, and making the surface very mellow. Holes were dug six feet apart each way, and one large shovelful of compost-manure put in a hill, covered lightly with the soil. The piece was planted June 15, supposed to be with pure Marrow-seed. They came up very readily. As soon as they began to break ground, they were covered with plaster, and kept so until the bugs were out of the way. I find by experience that I have been troubled less with the maggot, till this year, by keeping the ground level. Mode of cultivation is as follows: —

Twelve hundred pounds of squash at $3 per hundred		$36 00
Ploughing	$1 00	
Carting manure	1 50	
Spreading manure and harrowing	1 00	
Digging holes and manuring in hill	1 00	
Plaster	25	
Seed	25	
Planting	50	
Cultivating and hoeing	3 00	
A cord and a half of manure, one-half to land	6 00	
Interest and taxes	50	
Harvesting omitted		
		15 00
Profit		$21 00

FRAMINGHAM, Sept. 17, 1877.

FRANKLIN.

[From the Report of Committee.]

In no season, perhaps, in the memory of man, have favoring skies and a responsive earth done more to second the labors of the husbandman than they have the present: and strange indeed will it be if the like, in all kinds of cereals, shall happen in this generation; so that the products of the fields for this year will be no safe and accurate criterion by which to judge or forecast the production of the next year, or the immediate future. This season we must regard as an exception, and so lay our plans, and moderate our desires and expectations, that we may not be unduly disappointed if we do not reap the rich reward for the same expense.

That we can regard our well-directed efforts in soil-culture as a merited reward may be inferred from the fact, that from forty-five to fifty bushels of sound, plump wheat, can be raised from one acre of land (as was the case with Mr. Brown of Sunderland and Mr. Childs of Deerfield) at an immediate expense of not more than fifty cents per bushel. This being so, we ask what better inducement can be offered to encourage all farmers to engage in the raising of this noble grain? Is it not better than it is to depend upon the West or California for the materials for our bread? Though their success was most marked, we have no doubt that others would approximate very near to them, should they attend to the underlying conditions.

So, too, in regard to corn, when we find that from fifty to one hundred and more bushels of corn can be raised from one acre, as was the case with Mr. E. C. Parker of South Deerfield, Mr. D. O. Fisk of Shelburne (on his Greenfield farm), Messrs. E. H. Fisk, I. W. Barnard & Son, and G. P. Carpenter of Shelburne. Mr. E. C. Parker, on a light, sandy pasture, — from an expenditure of twelve dollars for manure, fish-scraps, and potash, sowed broadcast, — obtained fifty bushels of sound corn per acre; D. O. Fisk, on rather a firmer sandy soil, — with a compost of meadow-muck, leached ashes, and superphosphate, at a cost of fourteen dollars per acre, sowed broadcast, with two hundred pounds of phosphate put in the hill, — harvested some sixty-five bushels of sound corn to the acre; while the others we have named, on good arable land, at an expenditure of from thirty to forty dollars for stable-manure and superphosphate, secured a hundred and more bushels of corn per acre.

The experiments of Messrs. Parker and Fisk, if we assume that the value of the fodder will pay the cost of culture (and the same may be said of the others), clearly shows that corn can be raised here in Franklin County very much cheaper than it can be transported from the prairies of the West. And what is of greater interest is the fact, that, bushel for bushel, our native grain is of greater nutritive value than that which grows in the West. This has been shown by chemical analysis as well as by practical experiment. Dr. J. R. Nichols states in the December number of "The Boston Journal of Chemistry" that a bushel of ears of our domestic

corn ground with the cob is worth as much for all kinds of feeding-purposes as a bushel of solid Western corn. If so, then we make a sad mistake when we depend upon the Western granaries for our supply of this useful grain, and do not cultivate our own soil to its fullest capacity.

In the absence of any authorized standard, in making our awards where there was sufficient competition, we have been guided by the rule of superior excellence, with the exception of the corn-crop, but there by quantity, as there was equal excellence. To us it seems that the best interests of agriculture can be subserved by learning how to produce the largest given crop at the least expense, and that this should be the rule by which all decisions should be made, or awards determined.

S. Barber, *for the Committee.*

ONIONS.

[Statement of Alvin E. Sanderson, Sunderland.]

The crops raised on this land for the two years prior to 1877 were onions, three cords of barnyard-manure being used each year. The land was ploughed five inches deep in November, 1876, and harrowed and raked smooth in April, before sowing; the same quantity of manure being used as in the two prior years. Two pounds of Yellow Danvers onion-seed were sown April 7, with a Harrington seed-sower. A hand cultivator was used between the rows; and the crop was weeded by hand five times.

Between Sept. 18 and 25 the onions were raked from the rows into beds, left to dry a day or two, then taken to a shed, and spread, where they laid till the last of October.

Cr.		
Value of product, 226 bushels		$113 00
Dr.		
Ploughing and preparation	$3 00	
Manure	23 00	
Seed and planting	3 00	
Cultivation	20 00	
		49 00
Profit		$64 00

[Statement of C. K. Smith, Sunderland.]

The half-acre upon which the onions grew which I have entered for premium was in grass in 1875, and tobacco was grown upon it in 1876: in the spring of 1877 manure, at the rate of sixteen loads per acre, was ploughed in. Three pounds of seed were sown May 1, in drills sixteen inches apart. The crop was harvested Oct. 1, and the yield upon two rods was five hundred and twenty-five pounds

Cr.		
Four hundred bushels onions, at 50 cents		$200 00
Dr.		
Manure, eight loads	$16 00	
Seed	7 50	
Ashes and guano	8 00	
Labor	40 00	
Rent of land	20 00	
		91 50
Profit		$108 50

WORCESTER SOUTH-EAST.

CABBAGES.

[Statement of John Miller.]

My crop of cabbages was raised on two acres of land that was in grass in 1876. The soil is a black loam.

Raised 17,600 cabbages, averaging six lbs. each, at a half-cent per pound	$528 00	
Cabbage-plants sold	40 00	
		$568 00
Ploughed twice at a cost of	$10 00	
Sixteen cords of stable-manure	120 00	
Ten barrels of hen-manure	10 00	
Five barrels of ashes	5 00	
Cultivated five times, hoeing four times	58 00	
Cost of (Stone Mason cabbage) seed	7 00	
Planting	30 00	
Rent of land	50 00	
Harvesting	10 00	
		300 00
Profits		$268 00

DAIRY STOCK.

ESSEX.

[Statement of J. D. W. French.]

I enter for premium for best herd of milch cows my Ayrshires, — Lillie Douglas, 549; Lilac Douglas, 2,721; Alice Brand, 833; imported Primula, 3,096; and Jenny Burke, 2,556. These animals are all recorded in the "Ayrshire Record," published by the Ayrshire Breeders' Association. The last two were bred by the exhibitor. The milk of each cow has been carefully weighed twice a day.

THE RECORD FOR TWO SUCCESSIVE YEARS, EXCEPTING PRIMULA, WHO WAS IN MILK FOUR HUNDRED AND TWENTY-FOUR SUCCESSIVE DAYS.

Name, Number, and Age.	Years.	Number Days in Milk.	Number lbs.	Average per Day.
Lillie Douglas, No. 549	1875.	305	5,657	18.15
Calved May 2, 1864 .	1876–77.	290	5,179	17.85
Lilac Douglas, 2721 .	1875–76.	330	5,301	16.06
Calved April 4, 1873 .	1876–77.	283	4,966	17.54
Alice Brand, 833 . .	1876.	271	5,688	20.98
Calved Jan. 27, 1870 .	1875.	285	6,342	22.25
Primula, 3096 . .	1876–77.	424	6,752	15.92
Calved May 18, 1873 .				
Jenny Burke, 2556 .	1875–76.	258	4,745	18.39
Calved Oct. 21, 1873 .	1876–77.	288	4,889	16.97

You will notice that Lillie Douglas is thirteen years old; Alice Brand, seven years old; Lilac Douglas, four years old; Primula, four years old; Jenny Burke, four years old in October, 1877.

Lillie Douglas dropped a bull calf April 1, 1875, and again a bull calf May 26, 1876–1877.

Lilac Douglas dropped a bull calf March 16, 1875; a bull calf April 24, 1876.

Alice Brand dropped a cow calf December, 1874; a cow calf Dec. 12, 1875.

Primula dropped a cow calf Jan. 29, 1876.

Jenny Burke dropped a cow calf Nov. 6, 1875; a bull calf September, 1876.

RECORD SINCE DROPPING LAST CALF, TO SEPT 1, 1877.

	Number Days in Milk.	Number lbs.	Average per Day.
Lillie Douglas dropped c. c. July 4, 1877	55	1,307	23.76
Lilac Douglas dropped c. c. Apr. 17, '77	126	3,760	29.84
Alice Brand dropped c. c. Nov. 22, 1876	272	6,384	23.47
Primula dropped c. c. May 25, 1877 .	97	2,522	26
Jenny Burke dropped c. c. Aug. 24, '77	7	214	30.57

[Statement of Manner of Keeping, &c.]

Summer Treatment. — From about the middle of May to Nov. 1, milking begins at a quarter before five, A.M., and half-past six, P.M. The food during that time is pasturing, with a feed of fodder (corn or grass) during the months of August, September, and October.

Winter Treatment. — From Nov. 1 to about the middle of May, milking begins at five, A.M., and five, P.M. After milking in morning, each cow is given one feed of good hay; after that is eaten, ten quarts of cut mangels and turnips, or mangels alone. They are then carded, cleaned, and bedded. At eleven, A.M., watering begins. At noon each cow receives a foddering of corn-fodder or poor hay; at four, P.M., a foddering of good hay and two quarts of corn-meal (the corn is generally ground with the cob). After the evening milking the cows are bedded, and then left for the night. The committee will observe that my feed is not excessive, but, on the other hand, very moderate. My cows could be forced into giving much more milk than is shown in the record. The dry cows do not receive any grain. The amount of hay fed per day is from twenty-five to thirty pounds.

[Statement of George W. Russell.]

I offer for premium my herd of seven cows,—pure bred Jerseys. They were fed in winter with hay, and four quarts of shorts and one peck of roots morning and night. In summer they have been kept in a common pasture, and had four quarts of shorts per day.

"Nellie Blenn, 2d," dropped bull calf Oct. 13, 1876; due to calve Aug. 3, 1877.

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
October (15 days)	405	27
November	810	27
December	790	25.484
January, 1877	775	25
February	651	22.45
March	682	22
April	600	20
May	558	18
June	450	15
July (15 days)	105	7
Total for 273 days	5,826	21.34

"Nellie Blenn" dropped calf Dec. 14, 1876; due to calve Oct. 27, 1877

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
December (10 days)	205	20.5
January, 1877	581	18.74
February	504	18
March	503	1.623
April	427.5	14.25
May	403	13
June	360	12
July	325.5	10.5
August	186	6
Total for 253 days	3,495	13.82

"Belle" dropped calf Sept. 6, 1876; due to calve Aug. 2, 1877.

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
October	555	17.9
November	488	16.27
December	434	14
January, 1877	372	12
February	283	10.11
March	279	9
April	270	9
May	248	8
June	195	6.5
July	155	5
Total for 304 days	3,279	10.79

"Sultana," imported, dropped calf May 14, 1877; due to calve March 25, 1878.

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
May (15 days)	215	21
June	600	20
July	573.5	18.5
August	465	15
Total for 107 days	1,953.5	18.26

"Daphne" dropped calf Feb. 25, 1877; due to calve March 17, 1877.

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
March	449.5	14.48
April	300	13
May	360	12
June	315	10.05
July	248	8
August	186	6
Total for 184 days	1,948.5	10.59

"Daphne, 2d," dropped calf March 26, 1877; due to calve March 2, 1878.

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
April	607.5	20.25
May	589	19
June	525.5	17.52
July	496	16
August	372	12
Total for 153 days	2,590	16.93

"Rosa R.," two years old, dropped calf July 18, 1877.

RECORD OF MILK.

Months.	No. of Quarts.	Average Quarts per Day.
July (10 days)	92	9.2
August	248	8
Total for 41 days	340	8.29

WORCESTER SOUTH.

JERSEYS.

[From the Report of the Committee.]

In judging of Jersey stock, in the opinion of your committee, different qualifications should govern from those that govern in other stock. They seem to be a breed especially created and bred for the purpose of making milk and butter, and as such should merit premiums for those especial objects. No sane man would think of breeding Jerseys for beef; and scarcely will you find them in a dairy for selling milk or making cheese. Their especial fitness seems to be in their butter-making qualities, which are apparent even to the casual beholder. Your committee were gratified to find so great an interest in this class of animals; and we think the breeding of Jerseys within the limits of this society might be profitably increased, as the principal product of the dairy is

butter, it being conceded that a given number of quarts of their milk will make more butter than a given number of quarts of any other breed, — not giving a great quantity as a general rule, but rich in pounds of butter; requiring good keeping, care, and attention, which, in fact, all well-bred stock require, and those not well bred should have. That all intelligent farmers are arriving at this conclusion is apparent to any one who will take the trouble to ride around among the many good farmers within the limits of this society. It is claimed by some that the Jersey cow will, in the twelve months, give as much milk as the Ayrshire, while the pounds of butter largely exceed that of any other breed; and the price which well-made Jersey butter brings (being largely in excess of the common article) would seem to make the keeping of this class of animals profitable for our farmers in this region. She has been called the rich man's cow; and while, no doubt, under the liberal feed and shelter of such, she attains the highest degree of excellence, yet at the present time the price of these animals would seem to be within the reach of any one; and, for those who keep but one or two to furnish milk and butter for the family, they seem to be admirably adapted. In size small, in disposition quiet, when treated with kindness docile and affectionate even, but capable of resenting insult and blows; the bull becoming cross and savage oftentimes under cruel treatment. Having arrived at these conclusions, we have no hesitation in recommending Jersey stock to all who keep a dairy for the purpose of making butter.

THOMAS H. JONES, *Chairman.*

WORCESTER SOUTH.

AYRSHIRE AND GRADE AYRSHIRE.

[From the Report of the Committee.]

To understand more fully with regard to the different breeds of cattle, it is important to know for what purpose they are bred, — whether for work, for the butcher, or for dairying purposes.

It seems to be settled that the Shorthorns are of larger growth and of quicker maturity; so that for the butcher they would seem to take the lead. For work, if we take into account size, symmetrical proportions, and docility of temper, they would also take a prominent place; but if we consider beauty, activity, and general work on the farm, probably no breed excels the Devon. But as horses have, to a great extent, taken the place of oxen for work on the farm, the Massachusetts farmer must turn his attention to the stock most profitable for dairying purposes, or for the production of milk to be consumed in that form, or for the manufacture of butter and cheese.

The seller of milk looks for the cow that will give him the largest quantity in proportion to the amount of food she consumes. It is sometimes said that the flow of milk depends upon the feed of the cow. To a certain extent this is true; but every farmer or milk-producer knows that a herd of cows fed precisely alike (all other things being equal) will not give an equal quantity of milk; so that, in the breeding or selection of cows, it is important to look well to the development of their milking qualities.

For profit the dairyman must combine quantity with quality; and here he is drawn to the Ayrshire, — a cow not large in size, but one that stands foremost as a milk-producing animal.

One herd only of Ayrshires was on exhibition, composed of pure-breds and grades. A question here arises as to which are superior for practical purposes. A grade cow may be just as good for her milking qualities, and she may not. There is a degree of uncertainty in grades which is not found in the pure-breds. With pure-breds there is almost a certainty of reproducing the qualities of the original stock; while in grades you may or you may not get a reproduction that will prove satisfactory. At all events, a pure-bred is needed upon one side, or there will soon be degeneracy.

In summing up, your committee would say, that in their opinion, and from the best information they are able to obtain, there is no cow that will give so good returns for the expense of her keeping as the Ayrshire.

N. S. Hubbard, *Chairman.*

BREEDING HORSES.

HOOSAC VALLEY.

[From the Report of the Committee.]

The breeding of fast trotting horses has not been very satisfactory to many gentlemen who have made it something of a study, and who have spent large sums of money in experimenting. The theories advanced by our best horsemen are not practically operative in producing the results promised. If we could breed a mare that could trot in 2.30 to a stallion of the same speed, and have a colt that could make the same time, with care and attention in training, there would be a pleasure in the business, and a profit for our investments; and, until we can do this with reasonable certainty, all theories are defective, and the matter not understood.

My opinion is, that the treatment of horse and mare is greatly at fault. For instance, if I were to breed a mare that could trot in 2.30, I should have her in the best possible condition, — able to do her best upon the track. I should select a stallion that was perfect where the mare was faulty. The animal himself, and his family, in size, style, color, health, bottom speed, and, above all, in action, must be considered. He should also be in fine working-condition. The longer the lines of his trotting descent, and the more numerous they are, the greater the probability that his foal will inherit the desired quality. A horse may trot fast, and never get a fast colt, because he does not himself inherit the qualities strong enough from his ancestor. He inherited from a single line, "breeding back," and cannot transmit. We have families in which the trotting qualities have been transmitted for generations, and in several lines of descent; and, in breeding, the best practice will be to conform to the principles herein stated, and choose from them. I would then work my mare to nearly or quite her time for foaling, the first two months to her speed, after that gently, and, in my opinion, the colt will equal the speed of the dam at least. I will admit that

the colt will be smaller at birth; and the tendency would be, perhaps, to produce horses not over fifteen hands high; but I am confident that they would have speed, spirit, endurance, and strength, beyond all fancy breeding we have ever seen. Neither a large nor small dam or sire will perpetuate their likeness, unless descended from a breed or family of like characteristics. Using tall stallions or mares for that reason, if neither is exceptionally so, will lead to disappointment. Moderately small mares, if from families of good-sized animals, have generally better constitutions, and are often better for breeding-purposes.

As I said before, the fault with our breeders seems to be in the treatment of the mare. They run at will in rich pastures, not exercising over one mile each day. They are, consequently, very fat and soft, no hardened muscles, no strength, and apparently without spirit. During the whole winter they are kept in close stables, and throughout the whole period of gestation are kept in this miserable and unnatural condition. If horsemen will look at this matter, and give it study and attention, I am sure that they will agree with me that it is a serious error, and very largely the cause of so many failures in breeding this class of horses.

In determining what blood should contribute in selecting animals to breed from, the ascertained facts determine: 1st, that imported Messenger is the great source of the American trotting horse, and, further, that long-continued and thorough training of his descendants make them now immeasurably the most reliable stock to breed from for all the qualities desired; 2d, that Abdallah, son of Mambrino, son of Messenger, was the greatest sire of trotting and gentlemen's driving horses that ever had lived up to his time; 3d, that Rysdyk's Hambletonian was the greatest son of Abdallah, and immeasurably superior to him. No horse that has ever lived has approached him in the excellence of his get. They are not excelled by any other family in size, form, color, courage, docility, or intelligence.

The blood of the running horse is, in certain proportions, indispensable in the speedy trotter; but one-fourth or half blood is sufficient. In proof of these statements, suppose we take the American trotter, from Flora Temple down to the present time. We shall find George M. Patchen, Lucy, Lady

Snell, Sam Purdy, Hopeful, &c., all rich in the blood of imported Trustee and American Eclipse. Then George Palmer, Bodene, St. Julien, Prospero, American Girl, and Gazelle, are all strong in the blood of Grand Bashaw. White, Goldsmith Maid, Jay Gould, Mr. Wilkes, Frank Wood, Bella, Hotspur, John W. Conly, Rarus, Rosalind, Amy, Huntress, contain each a strong effusion of the blood of Abdallah. Then Mambrino Gift, Lady Thorn, and Lady Turpin, are each strong in the blood of Mambrino; while Mountain Boy, Commodore, Judge Fullerton, and Everett Ray are each highly endowed in the blood of imported Margrave. Smuggler and Grafton contain each strong effusions of the blood of American Eclipse; while Dexter, Nellie, &c., rejoice in the blood of Sir Henry, Lady Maud, Carrier, &c. Many others go back in a straight line to imported Messenger, Lunelo, Gold-dust, and Fleety; Gold-dust to imported Barefoot; Thomas Jefferson, to Wagner's imported Glencoe; Great Eastern to imported Consternation; Gloster, to Duroc; Comee, to imported Balrownie; Lula, to imported Horton; &c.

I know that it is fashionable with most people to have sixteen-hand horses, and that the present treatment and management of breeding animals tends to this end; but I believe it is done at a great sacrifice of good horses made worthless; and, in getting the size, we lose the essential qualities that make up an animal for the road and track. I shall venture to predict that the time is not very remote, when a fifteen-hand horse, weighing a thousand pounds, and having the courage, speed, and strength to make his mile or his hundred miles equal to the best, will be the favorite.

GILES K. TINKER, *Chairman.*

MARTHA'S VINEYARD.

[From the Report of the Committee.]

Of all the animals that man has domesticated and attached to himself for use or pleasure, the horse takes the lead. His noble bearing, beauty, strength, and sagacity have rendered him a general favorite with all nations, from the remotest ages. It would be interesting to know exactly what influence the domestication of the horse has had on the civiliza-

tion of the world. Of great antiquity, — originating in the East, — he spread over all Europe, and was finally brought to this country, where he was originally unknown to most of the aborigines. As we see him to-day, he is quite a different animal from his original prototype. — a little scraggy, wiry, unkempt creature, with scarcely a resemblance to the noble specimens of the present day. By careful breeding and culture he has been evolved into an animal of rare symmetry and beauty, of various breeds, each adapted to its respective use, — of work or pleasure. For our county the low-set, compact, short-gaited horse, weighing nine hundred or ten hundred pounds, is undoubtedly the best. Of the different breeds the Morgan comes the nearest to this standard. Some of the Canadian breeds are also excellent roadsters, easy keepers, tough and durable, and good for all work. They are far preferable, for our use, to the long-legged, slab-sided, raw-boned Western horse, that will weigh twelve hundred, and require half a bushel of grain a day to keep him alive.

If the farmers of this county would take pains to procure good breeding-stock, instead of worn-out, diseased animals, they would reap their reward in realizing a progressive improvement, and the island might become famous for its breed of horses. It costs no more to raise a horse that will readily sell for two hundred dollars than one that it would be difficult to dispose of for fifty.

The committee would suggest the propriety of offering a premium for the best walking horses. A gentleman, the past season, offered a hundred dollars premium for the fastest and best walker; but no competitors appeared. This would indicate that the aim of trainers was all in the direction of speed as trotters, without regard to utility or beauty. A strong, fast walk is a quality in a horse not sufficiently appreciated.

For general work, and travelling on heavy, hilly roads, they will make better time, and with more ease and comfort to themselves, than one which would trot much faster on a good road. An active, handsome, fast-walking horse that can trot a mile in four minutes is a much more desirable family horse than an ill-looking, gawky one that can go in 2.40.

WM. H. LUCE, *Chairman.*

SHEEP.

HOOSAC VALLEY.

[From the Report of the Committee.]

We are sorry to see the sheep in the Hoosac Valley going behind their record of 1865 to 1870; for there never was so good a time to improve a flock as within the last five years. We know that we cannot get the price for our wool that we did ten years ago; but what of that? Can we keep any other stock that will yield us more profit? We think not, with the present price of cheese and butter. Allowing the extra cost of production in care and labor, we think the balance will be in favor of sheep.

Ten years ago the hillsides of old Berkshire were covered with as fine flocks as could be found in any State, not excepting Vermont, which has long been noted for breeding the best sheep in the world. Where are they now? One would hardly find as many in a day's journey as could have been found in a single flock in 1865; and it seems to be the cry of almost every owner of the few small flocks now left, "I wish I could sell my sheep." The truth is, they have neglected them, and allowed them to die of disease and starvation; and how can a farmer expect profitable returns? We think no man of good common sense can help seeing it. Let us see how we have kept our flocks for the past few years. Have they been sheltered and fed as in former years? We think not; and what has been the consequence? A falling-off in weight of fleece from one to three pounds each. We know a flock that in 1870 averaged eight pounds of washed wool per head,—a large flock too,—and now it has dwindled down to one-fifth of the number kept then, and clips less than five pounds per head. Now, if it pays to keep stock of any kind, it pays to keep it well.

Your committee have always been in favor of fine wools, and are still: there is more money in them than in coarse ones. We know you can get more pounds of lamb from larger, but not one-half as much wool; for it takes a good flock of Southdowns to shear three pounds and a half, while a good flock of Merinos will clip eight. It costs as much to keep six Southdowns as ten Merinos, and, as for Cotswolds and other coarse breeds, they are, in our opinion, too tender for our climate; and we have tried it. Now, we think it is just as easy to see that there is more profit in fine wools, if we reckon all things, as it is to figure two times two are four.

Now, about selecting rams for stock sheep. It may be of some benefit to the breeder to have the experience of those who have made it a study for years; and we do not mean to say yet that we know it all or half. But never select a ram of a good breeder, unless he is in good condition, for you cannot improve him by any fair means; that is, to feed him more grain than he ought to have: the stock of such a sheep will almost invariably be tender. But choose one short-legged, with a round body, heavy breast with large folds about the neck, not much wrinkled behind the fore-legs, wide tail, and well woolled down the legs and in the face, and be sure to see that the fleece runs evenly, with no falling off under the belly.

We have shorn four pounds from the belly of a sheep, while other sheep as good looking in every respect would not shear six ounces. The fleece should be dense, with a sufficient quantity of white oil, not yellow gum; and we should avoid very greasy sheep, as they almost always lack a strong constitution, which is very desirable in a stock sheep. In the coarse and middle wools get a compact, heavy-breasted sheep, with short legs, as long-legged sheep are almost always tender. Select one in good condition: it is the best sign of a good constitution. We would say to our farmers, Stick to your sheep. There is a good time coming, when our flocks will pay us the best of any stock we can keep, if they do not do it now, which we believe they do. Improve your flocks when you can do it as cheaply as you can now, and we shall yet see the hillsides of old Berkshire covered with flocks as of yore.

J. H. GOODRICH, *Chairman.*

SWINE.

HINGHAM.

[From the Report of the Committee.]

The raising of swine is a profitable part of the business of the farmer. More or less of them should be kept on every farm, to utilize the refuse products, if no more. The additional manure that may be made, with care and labor, pays an important share of the keeping till the time for fattening.

In raising pigs there is, generally, even more profit than in pork-raising; though in some years, like the present, little may be realized from this source. Last year I sold a sow to a friend, and it took considerable argument to convince him that it was for his interest to purchase. In the winter I received a letter from him containing his statement of the profits on that hog. Of her first litter of pigs (nine in number), six were sold for twenty-eight dollars; three were fatted, and sold for fifty-one dollars. Of a second litter, seven sold for eighteen dollars; three were kept, of an estimated value of nine dollars; and the value of the sow then was thirty-five dollars. Deducting the first cost left a hundred and sixteen dollars as the receipts, including the keeping.

This experience is all on the right side; and there are often cases where bad luck attends the rearing of the young, and accidents occur which leave the balance, perhaps, on the other side. Still we believe that raising pigs, on the whole, is profitable.

We believe great care should be taken to select the right kind of pigs. We do not wish to advocate any particular breed; but, in selecting, the most desirable points to notice are length and depth of body, breadth of back, small bone, small head in comparison to size of body, full ham, and

shoulders well developed towards the head, short neck, dished face, short nose, and broad between the eyes. Swine with the head-characteristics we have enumerated are generally easy and quiet feeders, and fatten easily. A large, long head, long nose, indicate a hard, uneasy feeder, requiring much food to fatten well.

Where size is the desired quality, the best breed is pure white Chester, which have, in some instances, exceeded nine hundred pounds; and five hundred to six hundred pounds is quite common.

In fattening swine the first requisite is a dry, warm place to lie in. Cold, damp pens are a great hinderance, requiring more food and more time. Regularity in feeding is also an important matter, as it prevents them from being restless and noisy. Another point to be observed is to feed all that will be eaten, and no more. There is more economy in fattening early in the season, before the weather is cold. The practice of some, of shutting up hogs on a hard floor, is entirely wrong. Give them a place where they can have access to the ground, to root all they wish. When this desire seems too great, feed some charcoal, which will, in a great measure, prevent it.

In feeding roots, they should always be cooked to be used profitably. Grain should always be ground, if not cooked.

Your committee would suggest, that, in future, more system be used in entering swine for exhibition, and examination by committees for premiums and gratuities. Most of the entries this year were not in any particular class; only the name of contributor, and number of animals, being given. We would suggest that such a list of entries be taken, that the committee may know for what they are entered.

GEO. P. CHAPIN, *Chairman.*

NANTUCKET.

[From the Report of the Committee.]

In this branch of rural economy there has been a decided improvement over the land pike or alligator breed of our childhood days, in favor of the full, plump, round-bodied,

small-boned grunter of the present day. Breed after breed has been brought to public notice, each having its peculiar merits or demerits. Their name is legion; but still the cry comes to our ears, What is the best hog? Were we to go into the natural history of the hog, and follow up from the annals of the past in its primitive state to the present improvement, much could be written both amusing and instructive. If we go back in our researches to the historic page, we find that the hog was at that time of much importance. The ancients used pork as an article of food; the Greeks and Romans made the art of breeding and rearing swine a study, and every thing was done to impart a finer and more delicate flavor to the flesh. The poor animals were fed, crammed, and tortured to gratify the gluttony of the people.

We are informed by one writer that swine were fed on dried figs and honeyed wine in order to produce a disordered or diseased liver. With regard to the prohibition against the use of pork by Moses, there are differences of opinion. One writer supposes the law prohibited swine because of their filthiness, and observes that it is well known with what care and precision the law forbids all filthiness and dirt, even in the fields and camp, as well as in the cities. Another states that the Jews abstained from it in consequence of a leprosy, from which they had severely suffered, and to which the hog, in those climates, is very subject; that throughout Palestine leprosy is an epidemic disease, and, the Israelites being overrun with it at the period of their quitting Egypt, Moses found it necessary to enact a variety of laws respecting it; and prohibiting the use of swine as an article of food was one of these.

With us, no such disease enters our borders to decimate our numbers. No such affliction awaits us; and we are not separated from our friends, to die in some outcast place among the rocks or caverns in the mountains. But we court the presence of so useful an animal, and feel proud to have within our sight that which shall satisfy and cater to our tastes when the cold winter months shall bring us to our holiday seasons. But they cannot live on air. An old man of my acquaintance often remarked, "You cannot make pork on the grounds of coffee."

Now, there is a great difference in hogs concerning their

capability to take on fat. The long-bodied, long-legged, and razor-backed cannot take on fat and grow in what we should say a profitable or economical point of view, for he has fallen back towards his ancestors in this respect; while the hog of the present day is indeed an artificial machine to consume and change our milk and our corn into fat. On this point of fattening hogs, we would say that there are several points for consideration. After selecting what may be considered a good pig, provide him a good home, a shelter from the cold storms; for much food is wasted for want of a little thought. Fat is but an excess of carbon; and, if the piercing winds are permitted to exercise their power, waste of food is the consequence, and man cheats himself. I remember to have visited, on one occasion, a farmyard where a very strong, cold, icy wind was playing its revels, and two hogs were trying to find some place of refuge from the bitter frost, — no house to cover them; and their pen was composed of rails some seven inches apart. The story comes fresh to memory of the man whose windows were minus all the glass, and who, when asked why he did not have his windows mended, replied that there was no necessity, for the sashes kept out the coarsest of the cold.

Much has been said about feeding for profit, and how much corn will make a pound of pork. On this point men have disagreed. Food properly cooked is considered for the animal's best interest, as less exertion of the powers of digestion is requisite, and more time is given to quietude and repose; but all cannot conveniently cook the food, and must of necessity give it in its crude state. In the United States the hog-crop exceeds in value the whole cotton-crop; and the standing army of swine consume more than three hundred millions of bushels of corn. On the matter of how much corn will make a pound of pork, your committee are not sufficiently posted to give any very accurate estimate, as there are so many incidental matters to be taken into the account.

ALBERT EASTON, *Chairman.*

POULTRY.

WORCESTER.

[From the Report of the Committee.]

The committee consider the raising and keeping of fowls, when well understood, when those fowls are intelligently managed, one of the most important and profitable branches of farming; and we have never known an instance, where fowls were carefully and well managed, that they did not pay a large profit. Take, for example, the breeding and raising of pure-blood, or fancy fowls. It was thought by many, fifteen years ago, that the "hen-fever," as people termed it, would have its run, would soon die out, and that would be the end of it, for a while at least. Grave and sober farmers, and shrewd merchants, and, in fact, many people in society, laughed at the idea of paying a dollar per dozen for eggs for hatching. "Why," they would say (and your committee have heard this hundreds of times), "there never was a hen's egg worth more than from one to two cents, — what it is worth for food."

One Burnham, after making quite a little fortune himself in fancy fowls, wrote a book representing the fever as about at an end, and exposing, as he thought, some of the tricks of the trade; and, to amuse his readers, he represents Cochin fowls looking into attic-windows while standing on the ground; and on one page you will find a huge cut of a cock, with feathers growing the wrong way, which he names the "Butherum Pootherum." But notwithstanding those prophecies, and the ridicule that fancy-fowl breeding then received, the fever, as they then termed it, has continued to run, and is liable to run for aught we know, with some variations, for the next century. Never has there been a deeper interest manifested in the breeding of fancy fowls, hens, pigeons,

&c., than in the last five years, as the great shows held in our large cities go to prove. And, furthermore, your committee do not know of a single party who has managed to raise fowls of different breeds to the feather, as we say, perfect in color, form, &c., who has not made it pay, who has not made a good profit from it; and the reason is obvious. As far back as Moses, so far as we know, men of wealth, men of means, have gratified their tastes, and paid their money freely to possess animals well bred in regard to color, shape, expression, &c., be it cow, sheep, hen, or pigeon. Just as ladies who have means, who have plenty of money, will gratify their tastes for articles of dress, just because those articles are rare and expensive. Practically these finely-bred fowls and camel's-hair shawls are worth no more than the more common articles. A finely-bred bird, with certain marks, if it lay no more eggs, or make no more meat, than a healthy dunghill fowl, will sell for a much larger price to persons who have means to gratify their tastes.

Your acting chairman once indulged, to a limited extent, in the breeding of pure-blood fowls; and when he came to pay, as on one occasion, five or six dollars per dozen for eggs from a certain breed of fowls for hatching, his better-half made free to express her utter astonishment, that men with ordinary brains, men who seemed to have at least common sense about other matters, could be induced to pay fifty cents apiece for hen's eggs, no larger, no better, as she could see, than eggs that could be bought for from one to two cents apiece. It seemed the most insane, the most foolish, monomania, as it were, that ever came over human beings. We answered that it did not seem much more foolish to pay three dollars for six hen's eggs than for a lady to pay five thousand dollars for a camel's-hair shawl, or twenty-five hundred dollars for a little diamond ring just because it had a peculiar glisten, or ten dollars a yard for point-lace, while the ring and the lace were of no practical use, and a shawl that cost ten or fifteen dollars would make the lady literally as comfortable as the one costing five thousand dollars. But the woman had money, and she gratified her taste by purchasing the shawl at five thousand dollars. There was not less money in the world, it simply changed hands; and parties who needed the money more, perhaps, had become possessed

of it, and we hoped our six eggs for which we paid three dollars might turn out likewise on a small scale. Out of those six eggs, in due time, came four chicks; and, as they feathered out, there proved to be three pullets and a cock. But they never grew up on our hands; for, when about half grown, a gentleman of taste came along and got his eye on those chickens, and inquired the price of them. We thought we would be sure and set the price high enough: so we told him he could have the four chicks for sixteen dollars. He drew his portemonnaie, passed us sixteen dollars, and the chickens were soon caged and taken off; and we had reason to believe afterward that that man would just as soon have given forty dollars for those four chickens as the sixteen dollars which he did pay. But we received thirteen dollars for raising four chickens to half their full size; and, had our operations always been as good in other transactions, we should have been better conditioned than now.

We have never known an instance where a person succeeded in breeding and raising a superior fowl, or creature of any kind, that he did not get good pay for it. So much for fancy fowls; and we now come down to the real matter of fact of raising eggs and poultry for the market. It is just as much a science, if we may so speak, to take care of and make fowls profitable, as any other branch of farming; and we certainly think, that, according to the money invested, there is no live stock about a farm that pays a larger per cent than fowls. We know of a young man, now only eighteen years of age, who, two or three years ago, conceived a notion to keep a few fowls. With his own hands he built a moderate sized hennery, which improved his mechanical talent, which is ever a benefit to a boy; and, when it was completed, a limited number of hens were purchased, and placed in this building. He then, while attending school and doing many of the chores, took the best of care of these fowls; and in little over a year — from a year to a year and a half — he cleared net profit, after paying for every thing these fowls consumed — we mean he got for his time taking care of these fowls, which was no more time than he would have ordinarily spent for a little daily amusement, and rest from work and study — a hundred and forty dollars, and put it into a savings bank. The number of his fowls ranged

from a dozen to thirty, perhaps a little while in chicken-time more. How did he do it? By having a regular daily system of cleanliness and of feeding these fowls. In the autumn, some Saturday, when school did not keep, he drew with a horse a certain amount of gravel, which he put in a round pile like a haycock; and that fresh, fine gravel was constantly kept on the ground floor, in which the hens might wallow. The walls and ceiling of this little hennery were kept white-washed. A little powdered sulphur was used to keep away the lice. A board platform or floor was erected under the roosts, up from the ground: this floor was kept sprinkled with ashes or sand; and each Saturday these platforms were completely cleared of the droppings, which were saved in barrels.

Ground oyster-shells were constantly kept before these fowls; a little chopped cabbage-leaves or turnip-tops were often thrown in. And then these fowls were fed on a variety of food at regular times. A warm breakfast of scalded Indian-meal and shorts, and often, in cold weather, seasoned with a little pulverized cayenne-pepper, with a good meal of whole grain, such as damaged wheat, oats, or corn in the afternoon; a little chopped meat or scraps, say twice a week, with a pan or little tub of fresh water in one corner; and with this treatment these hens were cackling in their warm house, supplied with sun all the forenoon. And, when he carried the afternoon meal after school, twenty-five seemingly happy hens would present him with fifteen, eighteen, twenty, and sometimes twenty-one or twenty-two nice fresh eggs; while the mercury was often down to, and sometimes ten degrees below, zero.

Several neighbors, each of whom kept more fowls than this boy, and fed more feed in proportion to their number than he, but with no regular system whatever, did not produce an egg during the winter, not one, and were glad to purchase fresh eggs of this young man, and wondered why his hens were so much better than theirs. It seemed to take but little of this boy's time, — a few minutes in the morning for their warm breakfast, and about as long after school to carry their grain, and bring in the eggs, and on Saturday an hour or two to clean up and to regulate things. In computing the net profits of these few fowls we have not taken into

account from eight to twelve barrels of solid hen-manure, which was pulverized, and diluted with red sandy loam, and which served as compost in the hill for three or four acres of corn and vegetables, and which would well-nigh pay for the actual labor of this young man during the whole operation. Thus your committee have endeavored to point out the leading essentials in the management of fowls, believing that this is only a fair average of the profit of keeping fowls, if managed under a regular system, somewhat in this manner. This young man often affirms, that were he possessed of two thousand fowls, with ample room to keep them, he could in a few years, with life and health, make a fortune. He raised a few early chickens, watched the markets, and sold some of his large hens for a good price for the table, a little before early chickens were ready to kill, and after these hens had laid through the spring; and then stocked up again a little later. Yes, your committee believe that fowls thus managed are very profitable; and that a large number, if kept by twenties in different apartments, and each lot managed in the same way, would pay equal profits in proportion to their numbers.

J. H. Hero, *Chairman.*

HAMPDEN EAST.

[From the Report of the Committee.]

The exhibition of poultry was very fine this year for this society, — much the largest and best we have ever seen; there being forty-three entries. It is encouraging to see the growing interest shown in this locality in breeding fine poultry; for we believe, if properly managed and bred, that fowls are among the most profitable stock the farmer can keep. And we venture to offer a few suggestions, and point out a few errors that we presume some exhibitors entertain with regard to breeding "pure-blood fowls." In the first place we would say there is a vast amount of ignorance, both with regard to the course to pursue to produce good fowls, and also with respect to the points of shape, color, &c., which constitute or distinguish any given breed. Many labor under the mis-

apprehension, that, if their fowls are the offspring of pure-blood fowls, they must of necessity be pure, especially if the parent stock have taken some noted premiums. Premium birds do not always produce the best chickens; and no lot of fowls will prduce a progeny of a dozen or more, all of which will be true to form and color. There is a constant tendency to variation. The proportion of pure chicks may be large or small according as the parents were judiciously mated, or possessed of good constitutions, or to the number of degrees removed from imperfect stock, or from some cross introduced. And here let us say that crosses — sometimes made for the purpose of introducing some improvement in size, shape, or constitutional vigor, possessed by the breed introduced, and then all the other peculiarities of the foreign blood — are bred out again; but it takes several generations to do this. A breeder, then, to be in any way successful, even if he only breeds for his own use, and to exhibit his poultry, — should have a "standard of excellence," that he may understand the distinctive points of his breed, and know what to breed to. Then he has something of a guide in the selection of his breeding-stock; but still he needs to exercise thought, sagacity, judgment.

The cock has the most influence upon the "fancy points;" while the hen has the most upon the useful qualities. Any feature or peculiarity of constitution may be developed, improved, perpetuated, by selecting, year after year, those fowls which have the desired points in the largest degree. In each succeeding generation there will be some fowls possessed of the desired qualities in a greater degree than their parents. If either sex is inferior or defective in any point, it should be compensated for in the other sex. Very good fowls may be produced from ordinary stock in this way. Care should be taken not to make a specialty of any one point to the neglect of all others, nor, indeed, of any others that are of importance. Many evidently seek only to produce a good-looking fowl, or, in the large breeds, extra size, having, of course, some of the general characteristics of the breed they claim it to be, while it may have defects which utterly disqualify it to be reckoned as a pure-blood fowl. We think the combs and legs are the most liable to be disregarded.

At this exhibition there were numbers of fowls of other-

wise good qualities which had combs sufficiently bad to disqualify them. The comb of the cock should always be straight, erect (not lopping to either side), free from twists, fungus-like growths on the sides, having the shapes and features of its own breed. The comb of the hen in some breeds should lop to one side: in others it should be erect. The legs should be of the proper color. "Leghorns" should always have yellow legs; but some were exhibited this year having white legs. It is generally admitted, that, to insure the best success, the cock and hens should be of different ages. The strongest and best chickens are produced from a cock a year old, with hens of two; but it is generally true that the proportion of cockerels to pullets will be much larger than when the cock is two and the hens one year old. For this reason some prefer the latter plan. It must not be supposed that either rule is imperative, or that good chicks may not be expected from fowls of the same age; but in that case the fowls should all be fully a year old. As egg-producing is, perhaps, the largest source of profit to the ordinary raiser of fowls, they should be bred to increase their laying qualities, which may be readily done by selection, the same as any other peculiarity may be improved; and it might be well for this society to offer a premium for the pen of fowls exhibited producing the largest proportion of eggs in a year.

Care should be taken to breed from fowls not very nearly related to each other. Fresh blood should be introduced, but of course of the same breed.

E. J. WOOD, *Chairman.*

BRISTOL.

[From the Report of the Committee.]

Mr. Thomas Smith of North Taunton reports that he commenced, Jan. 1, 1876, with a stock of six hens. One was killed by accident in July. Had a stock of five the remainder of the year. They laid nine hundred and ninety-nine eggs. Sold eggs to the amount of sixteen dollars and twenty-four cents. Whole amount paid for grain, eight dollars and a half. Net profit, seven dollars and seventy-four cents, or more

than one dollar to each hen. Mrs. C. W. Farrington has a stock of about fifty hens: most of them are of a cross breed. Sells all of the eggs to consumers, thereby receiving the retail price of from four to six cents per dozen more than the grocers pay. This will nearly pay the cost of keeping, leaving a profit on the capital invested of nearly seventy-five per cent. Will other business with the capital invested pay any larger per cent than this? Mr. Chester B. Wilbur of Raynham is extensively engaged in raising poultry for the market. By hatching the chickens in February and March, they command a larger price than late fall birds. He did not give the amount of profit on his stock, but reported satisfactory results. If space would permit, we would mention many more that are engaged in raising poultry and eggs for the masses to consume, with as satisfactory results as those that we have reported here.

The number of coops of poultry, this being less than last year, seems to indicate that the interest in poultry is on the wane, especially by the farming classes, taking into consideration the pleasure as well as profit in this branch of agriculture. How much easier to give the poultry the little attention required, than is the trouble of raising, and the care of cattle, which no thrifty farmer ever complains of! When we pass a neat-looking farm, the buildings in good repair, the cattle and sheep fat and contented, and the home of a nice flock of Plymouth Rocks, Brahmas, Leghorns, or some other varieties, is not there, something is wanting to make that farm complete; for where is the individual that was brought up on a farm where poultry was kept, that does not remember the happy hours feeding the chickens, and hunting eggs in the hay-loft in his boyhood? No farm is complete without a well-regulated poultry-yard of thoroughbred poultry. How surely they pay for every kernel of corn they eat! In consideration of the importance of poultry to us, the question presents itself, What breed should we keep?

If raising poultry for market, we recommend Light Brahmas, Dark Brahmas, Plymouth Rocks, Houdans, and White Cochins. These are quick to grow, take on fat at an early age, and are of excellent color when prepared for market. If eggs only are wanted, then some of the small varieties are recommended, White and Black Leghorns, Brown Leghorns,

Games, and Hamburgs. We have about twenty White Leghorns, and know they are excellent hens to lay. Whatever breed you keep, they require proper care and food: the better care and keeping, the larger the returns will be. In setting hens, make the nest of clean straw or hay, dust it with sulphur. Eleven eggs are enough for the hen to sit on. Dust the hen with sulphur: it is as sure a preventive against lice as can be used with safety. Note the time of setting. When the hen has hatched all she will, remove her and the chickens to a dry, warm place. Feed them with bread-crumbs, scalded meal, shorts, and boiled potatoes, for five or six weeks. Dust the coop with sulphur-powder to keep out vermin. Give them milk to drink, and they will grow like weeds. For large lice, that sometimes appear on chickens' heads soon after hatching, apply lard or yellow snuff. The croup, or catarrh, is one of the most destructive diseases that appear in gallinaceous fowls. There is a running at the nose and eyes; the eyes swell; the whole head, mouth, and throat become affected. It is a slow, lingering disorder, sometimes continuing for months in the same subject. It is caused by damp, ill-ventilated hen-houses, and close confinement. A very good remedy is to keep fowls dry and warm; wash the head and mouth in soapsuds; give a few pills made of powdered charcoal and cayenne-pepper. Select a southerly position for the hen-house, that the hens may enjoy the sunshine in cold weather. Have a dry situation. Make the house so that it can be well-ventilated in warm weather, and yet warm in the coldest weather. It should be well lighted, and so arranged that the windows may be taken out to admit the air in summer. Remove the old nests as often as every month. Bury or burn them. Make new nests of clean hay or straw, and sprinkle them with sulphur-powder, and keep the house well whitewashed: make the whitewash very salt, and your hens will not be troubled with lice.

Want of good warm shelter in cold weather, want of proper kinds of food, want of pure water, excessive use of the male bird, bad management of any kind, will cause degeneracy. To improve fowls they must be well but not too highly fed, well watered, and managed every way for the promotion of their health and comfort.

J. R. PRESHO, *Chairman.*

FRANKLIN.

[From the Report of the Committee on Butter and Cheese.]

There is probably no part of the State where there is better stock, choicer dairy cows, and more and better butter and cheese made, nor better women to make them, than in Franklin County.

The first-premium butter deserves special notice. The cream of which this butter was made was by submersion, or after the Cooley process. An exhibition of this mode of raising cream was in the hall; also a sample of cheese made of the skimmed milk and buttermilk from this process, which, for flavor and texture, equalled cheese made in the ordinary manner, especially sone factory cheese, of which further notice will be taken hereafter.

Here is the statement of Mrs. J. L. Farr, who made it. She says, "This butter was made from a dairy of eight cows, part Alderney, Shorthorn, and native. No meal, or grain of any kind, was fed to them. The milk is strained into cans, then lowered into the well, where it remains twenty-four hours (temperature, forty-five degrees and fifty degrees); the cream is then taken off, and stands in a cool place, where it remains from twenty-four to twenty-six hours, then churned. The butter is thoroughly washed and salted (three-fourths ounce to the pound, well worked in), when it stands twelve hours, and is then worked with a paddle, and lumped. No coloring is used."

In regard to making butter after this process, one very important consideration is, that it brings the highest price in the market; and another is the increased value of the milk after the cream is raised: the milk is then as sweet as when first set, and consequently is worth much more for cheese or feeding than milk set in the ordinary way. This being so, it is a discovery worth thousands to the dairy interests of our country. The committee would therefore advise dairy farmers to give the Cooley system of butter-making a fair trial. "The Dairyman," published at Bellows Falls, Vt., or a pamphlet on gilt-edged butter, issued by the Vermont Farm

Machine Company, at the same place, will give all needed instruction on the subject. To those who do not adopt the submersion or Cooley process, we would advise, in raising the cream and perfecting the butter, a temperature of about forty-eight degrees or fifty degrees of heat: this has been found to be the best.

The committee would also invite attention to coloring butter. To give it a uniformity at all seasons of the year, and render its appearance more attractive, and increase its value and ready sale in market, some kind of coloring matter that does not interfere with the quality of the butter seems desirable and admissible. Carrots have been much used, and with little or no objections. There is highly recommended the preparation of Wells, Richardson, & Co., Burlington, Vt. If it prove all that is accorded to it, it is worthy of a trial by butter-makers for the market, as the color, as well as taste, has much to do in the sale of butter.

The statement made by Mrs. Sprague, who gained the first premium for cheese, was as follows: "This cheese was made from the milk of four cows, run up every night and morning, when the milk is warm from the cows. Add sufficient rennet to make a curd; whey off, then add one tablespoonful of salt to a pailful of milk; add one pint of sage-juice, and press two days for sage-cheese. The cows are two Jerseys, one Shorthorn and one native."

In regard to the changes that milk undergoes in making and ripening or maturing cheese, various theories have been advanced. That rennet causes the separation or formation of the caseine, or curd, in the milk, is well known; but what causes the fermentation of the curd necessary to constitute cheese is yet an unsettled question. It is claimed, that, like what is found to be yeast, there is generated an infinite number of infinitesimal germs of plants, called *torula*, the peculiar action of which produces the fermentation; and it has been strongly suspected that all infectious and cutaneous diseases are produced by similar causes. From what and how parasites and animalcules originate, and what their specific action, is yet in obscurity. However this may be, the common dependence for improvement in cheese-making must be experment and experience.

May it not be that the lowest forms of vitalized matter that

have been discovered by scientists, are the unicellular plants (in yeast called *torula*, or *infusoria*) found in water and other liquids, are the formative power, changing, by molecular action, meal into leavened bread, curd into cheese, and health into disease? Chemistry may yet determine.

In our judgment, the entry of factory cheese on exhibition was decidedly the poorest of the lot: the smell was rank, and the taste very unpleasant. We hope this was not a fair sample, or an average, of the cheese made at that factory. There is, doubtless, a great difference in the quality of cheese made at the various factories, and a difference in the taste and judgment of people of a good or a poor cheese; but one thing is quite clear, that cheese made of milk from all sorts of cows, with different feed, and coming from all quarters,—the cows, perhaps, milked by unclean hands, their bags besmeared with mud or manure, and the milk carried in improper vessels,—cannot be expected (nor if every kind of neatness was observed) to be equal to that made from one dairy, in the neatest and most careful manner, by skilful hands. A question may here arise,—after all the labor claimed to be saved by the factory operation, is it, on the whole, a benefit to individuals or the community? May it not be true that much of the time saved to women is not spent in that which is conducive of health nor advantage? Making cheese too hard work for women! Is not farm-labor too hard work for men, as well? Look through the community; and where do you find the strong muscle, the ruddy cheek, the sparkling eye, the cheerful spirit? Is it not among the wives and daughters of farmers, and dairy farmers too? "Early to bed, and early to rise," daily labor with social diversions, is the surest road to health and enjoyment. If more of our women, and men too, would follow this rule, there would be fewer invalids, and less doctor's bills to pay.

From the great value of butter and cheese, important articles of food and sources of profit, and, as they may well be called, luxuries which grace and crown the festal and frugal tables of our land, and all other countries, too great importance cannot be given to this department of husbandry. The committee would, therefore, not only recommend, but urge, the importance of giving special encouragement to dairy interests; so that our women — mothers and daughters, ladies

all — engaged in this business may well feel proud that they are not only furnishing the choicest food luxuries of the table, but adding to material wealth; and instead of deeming it drudgery, and esteeming it a hardship, may feel it a pleasure, thereby exciting the envy, instead of the pity, of those deprived of this employment.

The dairy interest lies near the foundation of our present system of agriculture, and is a fruitful source of inestimable value. Therefore to improve upon and perfect the best mode of butter and cheese making, knowledge of which is yet in its infancy, would seem to be of paramount importance to the farming interests, especially of Franklin County.

C. L. Fisk, Sen., *Chairman.*

HINGHAM.

[From the Report of the Committee on Butter.]

Changes may doubtless be made in every dairy, which will improve the quantity or quality of butter made. Some recommend cooling cream in summer with ice: others say good butter cannot be made if it is used. The thermometer has not yet come into general use in determining the temperature at the time of churning. It probably is useful, though good butter is made without it. It is more important to have the temperature right at the end of the process of churning than at the beginning. If the churning is too rapid, a loss in quantity of butter is the result; the buttermilk absorbing a portion of the cream. When there is danger of this, milk should be added before churning, to retard the coming of the butter.

Many a good churning is spoiled by using the hands in working or salting. When necessary to soften, change the temperature of the room.

Butter buyers demand a good bright color at all times of year. Thus in winter much artificial coloring is used; and we know of nothing so harmless as annotto, which is an extract of the outer coating of the seeds of a Brazilian evergreen. It is free from taste and odor, and pure in color. We prefer cows that make good butter the year round, and then

enrich the color by feeding corn-meal. In our opinion, three things are needed for success in the dairy: (1) Good cows, well fed and well cared for; (2) Extreme cleanliness throughout; (3) Quick and thorough working and salting. With these, any one of ordinary capacity will soon ascertain all further information by experience.

MRS. DAVID R. HERSEY, *Chairman.*

NANTUCKET.

[From the Report of the Committee on Butter.]

Milk from different animals varies considerably in its composition; and even from the same animal, under different circumstances of food, exercise, temperature, &c., a considerable variation in quality is observed. The average of a number of specimens of milk taken from several cows gives in a hundred parts 4.48 parts caseine or cheesy matter, 3.13 of butter, 4.47 of sugar of milk, .60 of saline matter, and 87.32 of water. Milk is much affected by the food of the cow producing it; and certain odors, such as clover-bloom and others less agreeable, can be readily detected in the milk when fresh. From this cause, decaying or putrescent food and slops should never be fed to cows giving milk. Cows should be selected for hereditary excellence as producers of snperior milk. Milk and cream must be kept at an even and comparatively low temperature, in a perfectly clean place, free from odors of every description. In the New-York butter-factories the temperature is not below forty-eight, nor above fifty-six degrees. The cream will nearly all rise in twenty-four hours, and should be taken off before the milk sours.

Butter-makers in Orange County prefer the old-fashioned dash-churn, and add cold water in summer, and warm in winter, at the rate of sixteen to thirty quarts of water to fifty quarts of cream. Thus the temperature of the cream in summer, when churning is commenced, is brought to about sixty, and in winter to about sixty-three degrees. It is preferred that forty-five to sixty minutes be employed in churning. The butter, after churning, must be kept in a reduced temperature, worked thoroughly, without much pressure, in such a manner as to exhaust the buttermilk or added water,

but not so as to break down the grain of the butter, and render it greasy. In the Philadelphia method great care, uniformity, and system characterize all its processes. The milking is done quietly and rapidly, the same milkman always attending to the same cows. The milk is set in deep tin pans, filled to the depth of three inches, and placed on an oak floor covered with running water of a temperature of fifty degrees. Cream is taken off in twenty-four hours, placed in vessels, and stirred whenever a new skimming is added. A barrel-churn is used, the churning lasting an hour, when a little cold milk is added to cause the butter to gather. A cloth which has been wrung dry in cold spring-water is repeatedly pressed upon the rolls of butter when they are made, until not a particle of moisture is seen upon them, and the butter begins to adhere to the cloth. This is called "wiping" the butter. An ounce of salt to three pounds is then worked in. This article is sent to market, and often sells for one dollar per pound.

Vermont butter has an excellent reputation in New England. The Green Mountains have been famous for good butter; and the best dairymen of that region keep the milk in cool, well-ventilated cellars in summer, and in a sweet, clean milk-room at other seasons. The temperature desired is about sixty; and, when it is reduced to fifty degrees, they scald the milk, and thus prevent bitterness, labor in churning, and loss of color. The milk is strained, and set as soon as it is drawn, and skimmed before it becomes thick (generally in twenty-four hours), when the temperature is up to sixty degrees, but much longer in proportion as it is colder. Many prefer to stir the cream every twelve hours, and sprinkle over the top with fine salt. When the butter has "come," the buttermilk is drawn off, and cold water or ice water turned in, and the butter thoroughly worked till rid of buttermilk; and, if it is then "crumbly" or "spongy," the water is worked out by hand very carefully to prevent injuring the grain, and rendering it greasy.

There is much poor, pale, ill-flavored butter made in winter: there is also some produced of a fair average quality, only coming short of the fresh butter from the fragrant grasses of June. The difficulty lies partly in the winter food, and partly in the temperature of the milk. Willard

says it should never be colder than fifty-five degrees, and, at churning, the cream should be brought to sixty or sixty-two degrees. If allowed to go above sixty-five degrees, the color and flavor are injured. It is liable to become bitter before the cream rises, if the temperature is too low; and, if it freezes, the cream rises at once, but is of poor quality, yielding white butter. If kept in a room heated by day, and cold at night, it will not rise well, and is apt to be bitter and acid. Philadelphia dairymen find no difficulty in making good butter all winter. One who obtains one dollar per pound keeps the temperature of his milk-pantry as near fifty-five degrees as practicable.

In testing the butter at the recent exhibition, the committee found some lots that had particles of salt undissolved. This is due to the practice of salting butter after it is churned, the salt not getting thoroughly dissolved. The way to remedy this, which we have practised for some time, is to salt the cream. When the cream is put into the churn, a sufficient quantity of salt is put into it to render it quite salty. When the butter is churned and worked, it will be found to be evenly salted, not a lump or grain of salt undissolved. Of course much of the salt put in the cream will not remain in the butter, but will be contained in the buttermilk. If you wish nicely flavored butter, salt it before you churn it. We use about a pint of salt to four gallons of cream: common salt that is pure will do.

ALEX. MACY, JUN., *Chairman.*

MARTHA'S VINEYARD.

[From the Report of the Committee on Butter.]

The manufacture of butter is increasing on the island, and it is one of our most valuable products. According to the census of 1875, the production of butter in the county was as follows: —

	Pounds.	Value.	Value per pound.
Tisbury,	6,239	$2,370	.38
Chilmark,	5,486	1,874	.34
Edgartown,	2,907	1,212	.42
Gosnold,	675	206	.30
Gay Head,	109	42	.40
	15,416	$5,704	.37

No arbitrary rule can ever be laid down for the successful making of the best quality of butter, because some of the conditions are ever changing; but the cow must be a good one, and fed upon old, rich, sweet, upland pasture, with plenty of pure, clean water, and the manufacture must be perfect. The main points in securing the best quality of butter seem to be having clean, healthy, rich milk; setting the milk in a moist, pure atmosphere, and keeping it at an even temperature while the cream is rising; churning properly, and thoroughly washing out all of the buttermilk; and also a thorough and even working-in of the salt. Cleanliness in all these points is an absolute necessity. Cream should be taken from the milk within thirty-six hours at the longest; and great care should be taken that it is perfectly sweet when churned. Every particle of buttermilk should be washed out in very cold water, with paddles, and never with the hand. An old, erroneous idea prevails here, that the milk should be set in shallow pans for the cream to rise properly; but the Orange-county farmers say the yield of cream is as great with seventeen inches of milk as at any other depth, the quantity of milk being taken into consideration. They further say that the cream thus raised is of better quality, as a much smaller surface is exposed to the air, and the top of the cream cannot become dry to so great an extent, and so injure the quality of the butter. Actual experiments with milk in vessels two to eighteen inches deep confirm the above. The depth of the cream was always in proportion to the quantity of milk.

WM. J. ROTCH, *Chairman.*

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ANALYTICAL INDEX

TO THE

AGRICULTURE OF MASSACHUSETTS.

REPORTS I. TO XXV.

[The abbreviation (Pt. 1) shows that the topic referred to occurs in the First Part, or Secretary's Report proper. The abbreviation (Pt. 2) indicates that the topic referred to occurs in the Second Part, or the Abstract. The numerals following these indicate the pages on which the topic treated of may be found.]

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[NOTE.—The Index of the Report for 1877-78 has been embodied in the General Index.]